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# SIXTEENTH ANNUAL REPORT

OF THE

# Ohio State Board of Agriculture,

WITH

AN ABSTRACT OF THE PROCEEDINGS

OF THE

## COUNTY AGRICULTURAL SOCIETIES,

TO THE

GENERAL ASSEMBLY OF OHIO,

FOR THE YEAR 1861.

COLUMBUS:
RICHARD NEVINS, STATE PRINTER.
1862.

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# MEMBERS OF THE STATE BOARD FOR 1861-2.

---

DARWIN E. GARDNER, *President*, Toledo, Lucas Co.
WM. DEWITT, *Rec. Secretary*, Cleveland.
C. W. POTWIN, *Treasurer*, Zanesville.
N. S. TOWNSHEND, Avon, Lorain Co.
T. C. JONES, Delaware, Delaware Co.
HENRY B. PERKINS, Warren, Trumbull Co.
JAMES M. TRIMBLE, Hillsborough, Highland Co.
DAVID TAYLOR, Columbus.
JOHN REBER, Lancaster, Fairfield Co.
JOHN M. MILLIKIN, Mamilton, Butler Co.
JOHN H. KLIPPART, *Corresponding Secretary*, Columbus, O.

The following is a complete list of the members of the Ohio State Board of Agriculture for 1862:

T. C. JONES, *President*, Delaware, Delaware Co.
HENRY B. PERKINS, *Rec. Secretary*, Warren, Trumbull Co.
DAVID TAYLOR, *Treasurer*, Columbus.
JOHN M. MILLIKIN, Hamilton, Butler Co.
DARWIN E. GARDNER, Toledo, Lucas Co.
WM. DEWITT, Cleveland.
C. W. POTWIN, Zanesville.
N S. TOWNSHEND, Avon, Lorain Co.
JACOB EGBERT, Lebanon, Warren Co.
NELSON J. TURNEY, Circleville, Pickaway Co.
JOHN H. KLIPPART, *Corresponding Secretary*, Columbus, O.

# PRESIDENT'S REPORT.

*To the General Assembly of Ohio:*

Pursuant to the law of 1846, for the encouragement of agriculture, the Ohio State Board make to you this Sixteenth Annual Report.

The proceedings of the Board, and of the several agricultural societies, as well as a general view of the condition of agriculture in the State, and facts and speculations interesting and useful, are presented by Mr. Klippart, Corresponding Secretary.

Mr. Potwin, for two years Treasurer, renders a very satisfactory financial exhibit.

The able reports of my distinguished predecessors are referred to with pleasure, as affording an interesting record of our industrial affairs for the last fifteen eventful years. A period in which marvelous change has been wrought in almost every department of knowledge and industry.

Many of their recommendations have received the favorable attention of the General Assembly and the sanction of the people.

The growing goodwill manifested by the Legislature towards the gratuitous effects of the Board to develop the resources, direct the skill, stimulate the industry, dignify the toil, and exhibit the achievements of our constituents, gives reward for the past and hope for the future.

Our crops for the year have been neither very good nor very poor—frost and drought and floods have caused some failures; yet our ample channels of trade are crowded with the surplus productions of the soil.

Many of the county agricultural societies surrendered their grounds for regimental camps, and hence there have been fewer fairs than usual. Those held, have been well sustained, and there is no probability of an abatement of interest in these genial festivals, which have done so much to improve our State and cheer our people. If prudently managed and properly fostered our county fairs are important helps to the government in securing that contentment without which the best institutions fail to bless.

The life of the farmer is retired; he needs occasional contact with the world—contact in which he plays no second part—where his efforts and productions constitute the objects of attraction—where he is first, and those who behold, whatever their ordinary position in society, are second. Such opportunity and such development the county agricultural society and fair affords.

What these fairs are to the counties, the State Fair is to the State.

It has hitherto been the policy of the Board to change the location of the fair every year, so as to afford to the people in different parts of the State a convenient opportunity to exhibit their productions and witness the achievements of others. In this way the State Fair has been brought within the reach of most of our people, at small cost and inconvenience to them.

The late fair was held at Dayton, upon the grounds occupied the year before, and at little expense in preparation, somewhat by way of experiment. The result can hardly be claimed to justify or condemn the plan.

Whether to hold the twelfth fair was a question of some interest; many of our best friends doubted the propriety of it. In deciding to do so, we did not overlook the solemn duty of every citizen to give his time, means, and best energies to our common country in whatever sphere most useful; nor did we disregard the hazards of failure. But charged with this specific trust, we sought to magnify our office, and deemed it well that at least Ohio should thus, near the borders of the rebellion, show the prosperity and the security of our people, as well as the stability of the institution for the time committed to our charge. Our appeal was nobly responded to; the fair was a success. In some departments the display was less, in others more, than usual. The attendance was liberal.

We gave a cordial welcome to the citizens of other States. Our neighbors of Kentucky and Tennessee hailed here the triumphs of peace denied them at home, and had favorable opportunity to compare the fruits of free and servile labor upon the fields of toil; while many a field of battle may teach the lesson that heroes are made of "mudsills" as well as masters, and that the drivers may be driven.

When this dreadful war shall have cleared the sky which ambition has clouded, Ohio may show a record of steady progress, furnishing a full share of officers and men, for the defense of our institutions, in the field. The interests of religion, education, industry and art, have not languished.

Under the smiles of God, our State is filled with plenty; plenty for ourselves at home—for our sons and brothers in the field and camp; plenty for the famishing of our deluded foes at the South, and for the needy abroad, for which we should be truly grateful.

We can hardly expect such abundance in the future; the drain upon the farm labor of the country and the probable vicissitudes of the seasons, renders precaution necessary to secure us in the future. We need better farming, if not more of it; better in the selection and preparation of the soil, the adaptation, culture and curing of crops; more economy in labor; in the use of the best implements; in the rearing, using and marketing of stock; more prudence in the household; a lively interest in the productions and comforts of home.

The old-fashioned virtues of honesty, sobriety, industry and economy, deserve and need to be fostered, and the graces and accomplishments of life will not the less adorn our frugal homes. Great trials can only be compensated by the higher developments of virtue. Our institutions and people are now put to the test.

To this end the efforts of beneficent government may be justly and wisely directed.

The establishment of a school or schools for the instruction of youth in the practical duties of agricultural pursuits, either by the State, or under its fostering care, is a work worthy the life and labors of our ablest and best legislators. This is an interest so vital, so vast and so enduring, that whoever lays the corner-stone of a successful school for its promotion, cannot fail to receive the highest rewards of a laudable ambition.

It might secure the geological surveys, the study of veterinary science, urged by my predecessors, and besides, many other branches of almost equal importance.

But above any specific interest, it would tend to give symmetry and dignity to the characters of our children, instructing them in the useful arts; at the same time, they may cultivate an acquaintance with each other and the glorious State we inhabit; thus fitting them to perform the duties, enjoy the privileges, and prize the blessings we possess. Other States have started in this work, and we may profit by the successes and failure of their examples.

It is to be hoped some plan may be devised to effect a change in the laws allowing the running at large of domestic animals. The present rule was applicable to our State in its early years, and is as necessary in some portions now. In the older and better improved sections a radical change is demanded; which should only be granted with a due regard to the interests of the newer and less favored.

We have been busy building railroads for the past fifteen years. They furnish wounderful facilities, and should be fostered as great helps to agriculture. Needless burdens should not be imposed upon so valuable an interest. They bring some evils, and these may be mitigated. The annual loss of human and animal life, the destruction, by fire, of fences and crops, suggest a few thoughts upon the improvement of our railroads.

If the many laborers required upon the roads were furnished with small, comfortable homes along the track, encouraged to drain the stagnant ditches, and cultivate or mow the unoccupied grounds, and as fast as practicable supply the place of decaying fences with sightly hedges, a better class of watchmen would be secured, and these avenues would gradually come to adorn, as they must ever enrich, the State. These ends might be hastened by some modification or enforcement of the requirements to fence the roads; but are dependent chiefly upon the voluntary enterprise of the companies interested.

Our State is so well supplied with fruit that there is little excuse for depredations upon our orchards and gardens; yet some more stringent or beneficent rules seem to be needed to guard even the health of the trespassers from the wanton destruction of unripe fruit.

Cruelty to animals is a revoltng crime, and worthy the attention of a Christian Legislature. We punish assault and battery upon those who can defend themselves; but those who inflict brutal injuries upon the mute partners of our toil, go unwhipt of justice.

Our acknowledgments are due to the officers of the county societies; to the exhibiters, committees and patrons of our State Fair, and to some distinguished friends of agriculture from neighboring States; to the cities and railroads which have furnished us needed facilities; to a liberal press (especially our own agricultural papers), for generous aid or forbearance; and last, though not least, to the fostering care of the General Assembly.

Respectfully submitted,

DARWIN E. GARDNER,

*President of Ohio State Board of Agriculture.*

# TREASURER'S STATEMENT.

### RECEIPTS.

| | | | |
|---|---|---|---|
| | Amount received from State Treasurer | | $960 84 |
| Sept. 10, | amount received from 1st day's gate receipts | $444 00 | |
| 11, | " " 2d " " | 1,036 55 | |
| 12, | " " 3d " " | 4,360 25 | |
| 13, | " " 4th " " | 2,195 38 | |
| | | | 8,036 18 |
| | Amount received from Dayton subscription | | 5,000 00 |
| | | | $13,997 02 |

### DISBURSEMENTS.

| | | | |
|---|---|---|---|
| | Premiums of 1860 paid in 1861 | | $343 00 |

#### EXPENSES OF FAIR, 1859.

| | | | |
|---|---|---|---|
| March 2. | Samuel Johnson, services in Treasurer's office | $20 00 | |
| | Luther Donaldson, " " " | 20 00 | |
| | | | 40 00 |

#### EXPENSES OF FAIR, 1860.

| | | | |
|---|---|---|---|
| Jan. 14. | P. Gregg, boarding | 60 00 | |
| Sept. 13. | J. W. Andrews, hay | 2 75 | |
| 14. | Loomis & Barnett, hardware | 12 71 | |
| 14. | Rogers, Fowler & Ackey, hardware | 81 19 | |
| 14. | J. Patterson, sawing lumber | 42 95 | |
| 14. | T. Morrison, use of fence | 20 00 | |
| 14. | H. Jackson, sundries | 16 50 | |
| 14. | " care of grounds | 29 50 | |
| 14. | B. Best, cementing spring | 3 00 | |
| | | | 268 60 |
| 14. | Office expenses | | 122 46 |
| 14. | Express account | | 78 37 |
| 14. | Postage " | | 37 93 |
| 14. | Telegraph " | | 19 42 |
| 14. | Clerk hire " | | 324 00 |
| 14. | Medals, ribbons, and diplomas | | 527 64 |

#### PRINTING ACCOUNT.

| | | | |
|---|---|---|---|
| May 9. | Harris & Hurd, in part | 25 00 | |
| Sept. 14. | B. G. Burroughs, cards | 2 00 | |
| 14. | Benedict, Fairbanks & Co., posters | 172 50 | |
| 14. | W. A. Shuey, posting " | 5 00 | |
| 14. | R. H. Geary, sundry printing | 48 00 | |
| 17. | W. T. & J. P. Comley, cards | 62 25 | |
| 18. | Thomas Brown, advertising | 16 50 | |
| 23. | G. W. McLean & Co., " | 5 00 | |
| Oct. 1. | Harris & Hurd, printing | 13 25 | |
| 2. | Follett & Foster, " | 5 75 | |
| 28. | L. Tucker & Son, advertising | 3 00 | |

| | | | | |
|---|---|---|---|---|
| Oct. | 28. | Gabriel & Marcy, posting bill | $2 50 | |
| Dec. | 9. | Cincinnati Gazette, advertising | 8 60 | |
| | 9. | W. T. Denny, printing premium lists | 215 00 | |
| | | | | $584 35 |
| | 9. | J. R. Hubbell's hotel bill | | 219 75 |

STATE FAIR EXPENSES.

| | | | | |
|---|---|---|---|---|
| Sept. | 17. | Thos. Alden, evergreens | 39 00 | |
| | 17. | Owens, Lane & Dyer, use of engine | 75 00 | |
| | 17. | B. Marot, use of chairs | 5 00 | |
| | 17. | J. M. Millikin, sundries | 10 00 | |
| Nov. | 2. | A. Gebhart, lumber | 12 50 | |
| Sept. | 14. | W. Heaver, services | 14 50 | |
| | | | | 156 00 |

SUPERINTENDENT'S ACCOUNT.

| | | | | |
|---|---|---|---|---|
| Sept. | 14. | W. Heaver | 43 10 | |
| | 14. | J. W. Cridland | 50 00 | |
| | 14. | J. B. Clegg | 31 80 | |
| | 14. | J. A. Kieffer | 15 00 | |
| | 14. | J. S. Broadwell | 18 00 | |
| | 14. | John Griffin | 10 00 | |
| | 14. | Henry Theobald | 8 00 | |
| | 18. | J. Bull | 5 00 | |
| | 18. | John Kirkpatrick | 33 00 | |
| | 18. | E. A. Vining | 12 00 | |
| | 18. | E. M. Brown | 42 40 | |
| | 18. | J. Terrell | 10 00 | |
| | | | | 278 30 |
| | 18. | Forage account | | 218 73 |
| | 18. | Music " | | 167 00 |
| | 18. | Marshal " | | 37 00 |
| | 18. | Livery " | | 141 00 |
| | 18. | Board expense account | | 114 92 |
| | 18. | Premiums for Fair, 1861 | | 4,893 00 |
| | 18. | Treasurer's clerk account | | 96 00 |
| | 18. | Police | | 12 00 |
| | 18. | Secretary's clerks | | 84 06 |

EXPENSES FOR COLLECTING DRAFTS.

| | | | | | |
|---|---|---|---|---|---|
| From | Sandusky, | for | $133 00 | 2 00 | |
| " | C. H. & D. R. R., | " | 285 65 | 75 | |
| " | S. D. & C. R. R., | " | 609 77 | 2 50 | |
| " | D. & M. R. R., | " | 500 00 | 2 50 | |
| " | " " | " | 400 00 | 2 00 | |
| | | | | | 9 75 |
| Paid | John H. Klippart, salary | | | | 1,500 00 |
| " | Loan at Franklin Bank | | | | 1,033 00 |
| " | Sundry Executive Committee expenses | | | | 300 00 |
| | | | | | $11,606 12 |
| | Balance in Treasury | | | | $2,390 90 |

# VIEW OF THE CONDITION OF AGRICULTURE IN OHIO.

In accordance with the law requiring a report upon the general condition of agriculture, a circular embracing a series of queries was addressed to every agricultural society in the State. It is to be regretted that answers to these queries were received from less than half the number of societies to which they had been addressed, and in many cases there were no replies to more than three-fourths of the questions propounded. From this limited data the following general view was compiled:

The following were the queries on the subject of

## HORSES.

"Has any improvement been made in the breeds of horses in your county within the past five years?

"Is any considerable attention paid to horse-breeding?

"What breeds are most esteemed in your county?

"What strains are considered the best for draft?—farm purposes generally?—roadsters?

"What is the general price of a good horse?"

The interest the people of Ohio take in the improvement of horses has materially increased within the last few years. There are not half a dozen counties in which this is not true. The necessity for clearing land and for the use of oxen is, to a great extent, over, and the spirit of improvement in agriculture, gradually extending to every branch of labor, seemed first to concentrate upon the improvement of the horse. The possession of a good horse, one that is elegant, powerful, trusty and intelligent, is what almost every person is likely to gratify himself in, before building a fine house, or making other improvements necessary to his comfort or convenience. Not only is this true of farmers and professional men who have wealth, but it is true of young men, and of thousands who own little else

While we are breeding better horses than formerly, we are also breeding more of them. The demand for good ones for foreign markets takes a few every year; the increase of our city population makes a large number necessary to do its work; the increase in the use of machinery on the farm in place of human muscle, the greater amount of land cultivated and the disuse of the ox, makes it necessary that horses should be used more than ever. War, too, has increased the demand for them so it is not likely that there will be any decrease in the number of horses bred at present.

**Breeds.**—The breeds of horses most commonly sought in this State have been the Morgan, Bellfounder, Messenger, Hiatoga, Black Hawk, Flemish draft horse, with a few of the Norman, Cleveland Bay, English draft and Thoroughbred. To these might be added a multitude of horses of no particular blood, but a mixture of almost every thing, and from which, after all, a large share of our horse stock is raised. It may safely be said, that whatever breed of horses has been introduced into this State, the tendency has been to amalgamate it with whatever was previously possessed. We cross the new breeds on every thing we have, from the scrub mare to our best farm or carriage horses. We have not, as yet, bred with a definite end in view; nor kept the strains of blood separate, and for the distinct purpose for which they are by nature best fitted. Whether the result of this amalgamation will in the end result in improvement is very doubtful; and of late years our best stock breeders have, to a certain extent, discarded this general amalgamation for a more definite policy.

**Draft Horses.**—Most of the draft horses of Ohio have originated from the Flemish draft horses, or the Pennsylvania, as they are sometimes called. He is of smaller size than the English or Scotch draft horse, but honest, strong-limbed, enduring, rather slow, but well adapted to use on drays, and, slightly modified by the infusion of warmer blood, well fitted for the use of our express companies. In many sections of the State they are extensively used for farming purposes. In addition to these, there has been introduced within a few years, for improving this breed, the Norman Horse, the Cleveland Bay, and the English Draft Horse; and we may predict good results from their cross on our best draft mares, though as yet they have not been extensively introduced. What is most to be feared is their cross on small and spirited mares; any improvement from such a course cannot be expected.

**Farm Horses.**—Horses for general purposes, which will answer for the farm, the road, the carriage and the saddle, are those in which most improvement is desirable. But few men can afford to own a horse for a special use. The farmer makes the one that draws his plow and carriage, do his teaming, and when necessary, act the part of a draft horse or roadster. We have many good farm horses in Ohio, the blood of which is almost as uncertain as the source of a pail of water taken at random from the sea. There are hundreds of stallions kept in Ohio, with local names and mixed blood, very highly valued for horses of all work. We also use for general purposes horses of every description, from the Pennsylvania draft horse to the half thorough-bred. The rule, "every horse in his place," has never been adopted by the majority of farmers. In answer to the inquiry, addressed to the Presidents of the County Agricultural Societies of this State, "What breeds of horses are considered best for farm purposes in your county?" such answers have been returned as would indicate that as yet no particular breed has the preference over all others. A few prefer the Morgans; some the Bellfounders, Messengers, Highlanders, French cross, etc.; but it is doubtful if, when these names are given, this blood is indicated more than some others, so great has been their amalgamation with other strains. The same may be said of Roadsters, though, to some extent, we designate certain breeds as better roadsters than others; as the Morgans, Bellfounders, Hiatogas, Bluchers, and half Thorough-bred. The reason of this is, that a good roadster is also considered a good horse for general purposes, but a good farm horse may not be a first-rate roadster. The general introduction of the Morgan and Black Hawk horse into the State within the last few years, has given us a class of roadster horses of high order, especially when crossed on mares of fair size and good movement; and though the general complaint against the Morgan is his small size, yet we have some excellent farm horses resulting from crossing them on our best farm mares.

In improving the horses of Ohio, what we most need is a definite purpose, as the production of a draft horse, farm horse, or roadster, and not miscellaneous breeding. True, the latter system *sometimes* brings good results, but the former, rightly carried out, *always*. There is no *luck* about it. We may if we choose breed horses and predict results with almost as much certainty as the chemist predicts the result of certain experiments he makes in his laboratory.

Another fault of too many of our farmers is breeding from scrub and broken-down mares. There are hundreds of persons in the State who only keep a horse that will answer to "go to mill and chore about" with; and almost always these are allowed to breed. No matter how good the stallion may be, such a mare will never bring a good colt. It will be safe to say that half of the colts raised in the State are from inferior mares that ought not to breed at all. Many farmers who have a good brood mare do not allow her to breed, because they do not wish to stock their farm with horses, or because they desire the animal for work.

Very many times the question is discussed as to the relative influence of the sire or dam on the produce, and the difference of opinion on this subject arises mostly from predetermined notions. The man who breeds a thoroughbred horse is almost the only one who looks thoroughly to both sire and dam for the best results, and knows that without care in the selection of the latter the services of the former are not to the fullest extent available. The want of appreciating the value of the mare has retarded progress in the improvement of horses, and produced much loss to the State. The best mares find almost as ready a sale as horses, are worth nearly as much for any kind of labor, and are rarely bred from; while the long-legged filly that cannot be sold, and perhaps cannot do a good day's work, is made to pay her way by raising a colt. There is little doubt but the farmer who will incur a liberal outlay in procuring one of the best brood mares in the country—one whose sire and dam for at least three generations have shown themselves to possess desirable qualities, and then by the use of the best horses—will, if he perseveres in a definite and reasonable course of breeding, open a rich mine of wealth. Numerous instances might be adduced to verify this statement. Why should not the mare exert as great an influence on the colt as the horse? The opinions of the best breeders are that she does.

For breeding mares from which to raise horses for general purposes, those of good size, roomy, healthy, strong in the back, with large vital organs and good muscles, should always be selected. It is also important that they be of good disposition and not unruly. "Like produces like" almost universally. The mare that jumps is quite sure to learn her colt the same habit before it is taken from her side, or transmit to it her own trait. The Arabs had a law that no stallion should be used for service unless first examined by competent judges and declared to possess desirable traits. Such a rule applied to our mares would improve the horse flesh in the State fifty per cent. in ten years.

Of stallions, the improvement in Ohio by the importation of thoroughbred and others possessing desirable traits, there has been marked improvement within a few years, so that any farmer possessing a good brood mare will not find it difficult to secure the services of a suitable horse from which to breed. The tendency now among our best breeders is to secure as large a proportion of the blood of the thoroughbred horse as possible, of which this State may boast of several of high merit.

There is no doubt that an excellent class of roadsters, saddle and carriage horses and farm horses may be raised from a cross of the thoroughbred stallion on suitable brood mares. To perform those feats of which the blood horse is capable, in the race, great perfection of organization, both in mechanical construction and vital endowment, is absolutely necessary. These have been secured by a thorough course of breeding in a line for many generations. Horses thus bred impress their own character upon their offspring much more certainly than those of mixed blood.

The great popularity of the Morgan horse during the last five years has, to a certain extent, reduced the size of our horses more than is desirable; to remedy this defect, a few of our farmers are going to an opposite extreme, and breeding from small mares crossed on large stallions. The result of this cross will prove unsatisfactory, by the production of ill-shaped, slab-sided, loose-jointed animals, with neither beauty nor power.

Value of Horses in Ohio.—It will be safe to set down the value of good horses at the age of four and five years, sound and well trained, in Ohio, at $100. Of course there are thousands that can be bought for much less, but they are those bred from inferior mares. In those counties where care in breeding has been taken, the average value is much higher than $100; while in those where no care has been bestowed, the price is much less. In every county in Ohio the price of a horse is determined by his goodness, and this invariably is determined by the care bestowed in breeding him. At present prices there is as much and probably more profit in breeding horses than cattle. It is not likely, however, that a more extensive breeding of horses in the State would be profitable, unless at the same time corresponding improvement be made. For good animals paying prices may always be expected; none others can be raised without loss. The climate of the State is well adapted to them, and there is no reason why, if we breed the best, we may not create a foreign demand which shall prove remunerative.

## CATTLE.

"Has any improvement been made in the breeds of cattle in your county within the past five years?

"What breeds are most esteemed in your county?

"Are there any "Durhams" or "Short-horns" in your county?

"  "  Devons  "  "

"  "  Ayrshires  "  "

"  "  Herefords  "  "

"  "  Alderneys  "  "

"Which of the breeds, or which crosses, are considered the most profitable for beef?

"Which for work oxen?

"Which for milch?

"Have any experiments been made with cooked or boiled or steamed food for cattle; and with what success?

"Have any experiments been made with ground or unground food?

"Which system of feeding is preferred—that of feeding whole grains, or ground food, or boiled food?

"What is the probable cost of rearing a three year old ox or cow?

"To what diseases are cattle most subject?"

While great improvement has been made in the horses of Ohio within a few years, the improvement in cattle has also been marked by very rapid strides. From our climate, our location, with reference to market, and the ease with which corn, the great producer of beef, is raised, together with excellent pasturage and good water, the State may vie with any of its neighbors in the profitable production of cattle, both for beef, for work and milk.

BREEDS.—Of the five principal breeds of cattle, Short-horn, Devon, Ayrshires, Herefords and Alderneys, we have in great numbers the Short-horn and grades. There is not a county or township in Ohio but more or less of their cross is found. In many parts of the State fine herds of thoroughbreds are kept, which are hardly excelled in England. Devons are not so extensively dispersed, though there are some excellent herds of them, and their blood can be traced in much of the stock in the country. There are probably better Devons in the State now than formerly, though their numbers have not increased to so great an extent as the Short-horns. Of Ayrshires, Herefords and Alderneys, though there are a few of each, yet so few that as yet we derive little benefit from them. The native stock also largely predominates in many parts of the State, mixed more or less with both Short-horn and Devon blood.

BREEDS MOST ESTEEMED FOR BEEF.—For beef the Short-horn and its grade is considered most valuable. It may be considered an unsettled question whether a thoroughbred or a grade is most profitable, as the number of the former, which go into the hands of the butcher, is small, and no system of experiments has been made to determine the comparative value of the two. There is no doubt, for beef, however, that the thoroughbred and its grade possesses characteristics superior to the Devon. Its natural tendency is to fatten; and, possessing a large frame and a very vigorous digestive apparatus, and little activity, it is well adapted to convert large quantities of food into meat.

Best breeds for milk.—This is a question upon which farmers are divided. About an equal number favor the Short-horn and native, a few favor the Devon, while large numbers think a cross, between the Short-horn and Devon, or native, make the best milkers. It is a settled fact that some of the thoroughbred Short-horns are the best milkers in the world. Where all the powers of their system tend to the production of milk, this is the case. It is equally true that some of them are worthless as milkers, the tendency being to produce fat. In some families the tendency to produce milk appears to have been bred out. Those who consider native stock best for dairy purposes do not always count the number of failures in this breed as milkers. If one proves a good milker note is always made of it; if not she usually shows it before she is two years old, and is sold for beef. It is undeniable that most of our good dairy cows are grades with more or less Short-horn blood, mixed with both Devon and native; and, where this is the case, it is not easy to determine whether the quality originated in the cross or was inherited from one or the other strain. If we would breed especially for milk, always choosing our best cows and crossing them on thoroughbred Short-horn bulls, known to have decended from good milking families, we might perpetuate this quality; and it is doubtful if as good cows, for the dairy, can be obtained in any other way. Nor would beef-producing qualities be in the least injured by this course, as a good milker is much more likely to breed *and to fatten well* than a poor one. It is easy to breed from or fatten a good milker, but it is not easy to change an animal that shows great disposition to fatten into either one or the other.

Best breeds for work.—While the Short-horn and his grades is considered best for beef and milk, the Devon ranks highest for work. Though of less size, the activity of his temperment, and the development of his muscle, makes the Devon ox one of great sprightliness and power. The Short-horn makes a very poor working animal. His tendency to eat largely and produce fat in proportion to what he eats makes him lazy. A few would cross the Devon with the grade of Short-horn to increase the size of the ox; but what is gained in this way is lost by the sluggish disposition which it produces. Oxen are not used very much in Ohio for work. All the older counties to a great extent have used the horse almost exclusively for years. Where only one team is needed on the farm, so various are the uses to which horses can be put, they are unquestionably the best. Where more than one team is needed, the Devon ox, from his great hardihood, activity, ease with which he is kept, cheapness with which he can be rigged, and profit with which he can be fattened and sold at any time, makes him more valuable to the farmer than he is usually considered.

Feeding Cattle.—In the early settlement of the State, if cattle or horses ate grain, it was generally unground and raw. Now there is not a county in Ohio, and hardly a township, in which farmers do not consider it a great gain to grind all the grain fed to their stock. It needs no accurate system of experiments to satisfy the farmer that it is very wasteful to feed whole grain. Just how much is saved by grinding is not known, and it would be difficult to decide, as some animals musticate finer, have greater powers of digestion, and are able to manage whole grain better than others. Where a horse or an ox works it is calculated by many that one pound of oats or corn, finely ground, is worth a pound and a half unground—but of course this may differ somewhat from the truth. In Warren, Hancock, Ashtabula, Franklin, Ashland, Richland, Morrow, and a few other counties, we are informed that to a small extent cooking food for stock has been tested, and in every instance with satisfactory results. What we need now is something definite in regard to cooked food for animals. Reasoning from human experience, there should be a very great saving ; but how great, experiments alone can determine. If as much can be saved by cooking as by grinding, farmers would do well to look to the matter carefully.

Farm mills for grinding food are not very extensively used, farmers preferring to send their grain to the grist-mill rather than to own and run a mill of their own. If cooked food was used it would be necessary for farmers to have a steaming apparatus for the purpose, and it is doubtful if, as a majority of farmers conduct their operations, one would be used very extensively. Cutting hay, straw and stalks into very fine pieces before feeding is in common practice for working stock and milch cows, and the straw and stalk-cutter is considered so valuable that most of our best farmers use them. Some experiments have been made in England, in chaffing and cooking hay and straw, with results in favor of the process. It would be an easy matter to chaff hay and mix it with grain and roots reduced to pulp, and there is no doubt but food prepared in this way would be vastly superior to the usual method of feeding it.

Cost of rearing Cattle.—In a previous part of this article it was claimed that there had been much improvement in our cattle within the past few years. Cattle-breeding, however, has not yet reached anything like perfection, as is shown from what it costs to raise an ox or a cow to the age of three years. In answer to this question, addressed to the President of the Agricultural Societies of Ohio, the usual reply was, "Twenty Dollars." In a few of the counties where improvement had not made much progress, the reply was from "eight to fifteen dollars ;" and in those counties where our best stock is found, it was from thirty to fifty dollars. Assuming twenty dollars as the standard, we can easily see that any ox or cow, raised to the age of three years for this sum, cannot have had all the pains in breeding, and care in keeping, which is necessary to the best development of the animal Assuming that a good calf is worth when dropped $1, it will cost to feed it with six quarts of milk daily, for four months, $7.20. Pasturage for four months more, at six cents a week, $1. For wintering four months more, it cannot be done on less than half a ton of hay, which is worth $3. Here is $12 20 for the first year. For pasturage eight months of the second year, $2.50 ; wintering, $4. Do. third year—pasture, $3 ; wintering, $6.

Here is $27.70 at a low estimate, and making no allowance for grain or care. The value of the manure, however, might be made to offset this. How then do we account for the fact that the general estimate is so low? Only by supposing that cattle are not as well raised as they ought to be!

DISEASES OF CATTLE.—The cattle of Ohio are usually healthy. This is good evidence of the fitness of the climate, soil, water, etc., for breeding them. Occasionally, in some parts of the State, a disease known as "foot ail" has appeared, but its cause has usually been traced to the use of ergotted June grass. Murrain, which was formerly common, still appears in most parts of the State, but is much more rare than in the early settlement of the country. Its cause is doubtless impure water, as it is more frequent where there is much stagnant water, and rarely appears where it is pure and wholesome. Hollow Horn, as it is called by farmers, though less common than a few years ago, occasionally affects cattle in every district. It is usually caused by improper nourishment. Too high feed and breaking down the digestive powers, or starvation, will occasion it. We do not describe the disease or the treatment, as most farmers are already familiar with both. The true remedy for all diseases in animals is prevention. Most of them are caused by some fault in the manner in which they are kept—as too much, too little, or improper food, impure water, and too much exposure in winter, if left to run at large; or, if stabled, by confined air, loaded with effluvia from the animal secretions.

We will now proceed to view cattle from another stand-point. Upon cattle depends very much the perfection of our agriculture. The end to be attained in raising them is not always the same; sometimes it is work, as in countries addicted to the pursuit of agriculture proper, as in the largest part of Europe. We will consider them exclusively as producing "income"—that is, as supplying produce; consequently, readily saleable, and procuring direct revenue—such as stock and fat cattle, meat, tallow, hides, milk, butter, cheese, etc. For ages these productions were the only object of raising "income" cattle. There are still many districts where the same object is pursued; it being the only means of attaining an income from the land. This happens where soil and climate present great obstacles to cultivation, and admit of pasture only. This is an exception in France hardly to be met with outside the snowy slopes of the Alps and Pyrenees. Every where else the paramont product of cattle—that which causes them to be the foundation of agriculture, an imperative necessity, the *sine qua non* of progress, profit, and, we may add, of empire and civilization—is MANURE.

Animals being considered as producers of manure, are only machines to change fodder and litter into this material; and this applied to the soil becomes the material for the growth of vegetables. By the union of animal and vegetable products agriculture creates at the same time objects of sale, "income," and the material for its future production. No other branch of industry shows such a fact. We must admit, however, that while such a combination affords in some respects a superiority to agriculture over other branches, on the other hand it complicates in a great measure agricultural industry. It would be the same if steamer, which, in order to obtain profit from its freight, were obliged to manufacture the agents of her own propulsion.

For centuries a great error prevailed as to the part the soil acted in production; it was considered an inexhaustible source of production. Land does not cease production immediately for want of manure as an engine stops for want of coal, but produces less and less till labor spent on it ceases to be remunerative. Where such a course is followed not only is the cultivator ruined, but a decrease of population follows. *Exhaustion of the soil is the phthisis of nations.* The history of the world, and especially of Europe, teems with examples of such ruins. The shores of the Mediterranean Sea were once the seat of ancient civilization, of populous cities and numerous populations, all of which has more or less declined. Political revulsions, bad governments, and the invasion of Islamism, are not the only causes of the decay; because, whilst these do not apply to Sicily, Spain, Provence and Languedoc, another country—Egypt—continued to be rich, populous and fertile in spite of frequent revolutions and a brutal despotism. Egypt was the cause of the exhaustion of other lands, whilst her fate was to remain fertile; the most advanced nation of the old continent, Egypt sent forth colonies on many a district around the Mediterranean Sea, and of course she exported there her arts, her costumes, and her agriculture, which was then deemed so perfect; but that agriculture kept animals only for work; the production of manure was not even thought of; the periodical floods of the Nile afforded inexhaustible elements of fertilization; therefore, the Egyptian system of agriculture consisted in taking away from the soil as much as possible, without restoring anything.

This practice followed by Egyptian colonies brought decay and ruin to countries once fertile and prosperous, and which constituted the granaries of Rome. Lands which yielded 100 and 200 (?) bushels of wheat to one of seed now with better implements yield 5, or 4, and even as low as 3! Behold the secret of this decline from civilization and wealth to ruin and annihilation; it stands between 100 bushels and 4 bushels of wheat produced from one of seed.

Historians refuse to seek for the cause of the fall of empires in a heap of manure, but nevertheless the cause is there. The history of a nation is to be read from the aspect of her soil as well as from her written documents. See Provence for instance. The Phocean colony, following the Egyptian system of agriculture without cattle and manure, cultivated, then exhausted plain and valley; when urged by want, they cleared the mountain forests; all felt the ax, plow and pick, but nature cruelly punished this infraction of her laws; with the timber genial rains disappeared; heavy floods carried to the valleys first vegetable earth, then sand, gravel and stones, so that the country presents the desolating spectacle of denuded dry rocky mountains, and valleys covered with a deep layer of sand and pebbles.

Provence has no springs, no rivulets; there are rivers, which are dry during nine months of the year, when they suddenly become awful torrents, carrying waste and desolation on their overflown shores. Behold the consequences of cultivating without manure!

The result was not so fatal to Sicily, Algeria and Syria, but it was owing to some particular causes; in Sicily to the thickness and nature of the earth's strata and their general want of declivity; in Algeria and Syria to the depopulation which allowed nature to correct part of the mischief; there as everywhere else the first act of man was to destroy; his work of reconstruction begins late.

That which took place in remote ages and in the midst of events which could at a distance be mistaken as causes of the result, is being reproduced in America; the conditions in which this transpires do not leave any doubt as to the cause of the evil. Virginia, Georgia, and the Carolinas present the spectacle of numerous estates with buildings abandoned by their owners, who seek further west new settlements; and why? Let a Virginia editor answer:—"We have sold in the shape of tobacco, wheat and cotton, the blood and sinew of our land, which now exhausted refuses longer to pay the expenses of cultivation."

Thus in a few years a virgin soil, rich with the accumulations of centuries, is reduced to sterility by culture without manure. We may remark that in the United States, and particularly in those above named, cattle are not numerous, and being in the genial season, to avoid the labor of feeding them, allowed to ramble in pastures, extensive prairies and forests, produce little manure; and often the stables are so constructed as to allow in winter both the waste of urine and excrement, by rain or sun.

The Americans, persisting in the practice of the first colonists, make little use of manure, relying on protracted rest to repair their exhausted lands. It may be that owing to the sparseness of population this course is best. In the rich and populous State of Ohio the average production of wheat is 16 bushels per acre, and allowing one bushel to seed an acre, the yield is only 15 to 1.

Europe, and especially France, cannot do without manure to keep up the productiveness of their lands; hence the importance of cattle in their agriculture.

In the use of manure, we must bear in mind the following theorem: "Being admitted that the expenses of cultivation are in proportion with the extent of surface, indepently of the product, the effect of manure is in the same ratio with the richness of the soil;" that is to say, 100 pounds of manure will produce 15 pounds of grain in a soil which is already saturated with manure, 10 pounds in one of average fertility, and only 5, 4, or even 3 pounds in a poor soil.

Let us suppose two lots of the same extent and nature, both of them having received the same amount of work, manure and seed, one of them only being previously saturated with manure; this lot will be charged with an extra expense, but it will yield 25 to 30 bushels of wheat to the acre, whereas the other cannot give more than 10 or 12. It is evident that the extra expense charged to the former will be more than compensated by the surplus of 18 bushels, and therefore the cost of wheat is considerably diminished, as shown by the following table, which I copy from the *Journal d'Agriculture pratique:*

| Expenses by Hectare. | Tons of Manure absorbed. | | |
|---|---|---|---|
| | 9½. | 14. | 20. |
| Rent, taxes, cultivation | 140 fr. | 140 | 140 |
| Harvesting, thrashing, freight | 34 | 42 | 75 |
| Manure, at 7·80 the ton | 74 | 109 | 156 |
| Expenses for 1 hectare | 204 | 337 | 440 |
| Yield in hectolitres by hectare or bushels to the acre | 1.4 hc. | 20 | 40 |
| Cost of wheat with its straw | 21 fr. | 16.85 | 11 fr. |
| Deducting the straw | 3.48 | 3.48 | 3.48 |
| Price of wheat per hectolitre | fr. 17.52 | 13.37 | 7.52 |

Therefore we have the right to affirm, that in our agriculture "no profit is to be expected without manure;" that is to say, without "cattle," for therein resides the only means of increasing the quantity of produce and lessening its price.

We said that cattle are machines to turn forage and litter into manure. Contrary to the usual object of all other industries here, the manufactured product is less valuable than the material from which it is derived; the aim of agriculture is to obtain it without cost, and that end is obtained by continuing the manufacturing process, that is, turning manure into grass, wheat and meat, which brings money. The farmer who does not collect and use all his manure, is equal to a laborer who, having performed his work, neglects to take his pay; and hence we must consider cattle from the other points of view—of profit, such as work, milk, meat, &c.

Many of these branches are connected together in such a manner that, at first, it may seem profitable to unite them. For a long time the principle prevailed that an agriculturist ought to raise that which he consumes, and never purchase any thing. That principle is coeval with poor, pristine, and unimproved cultivation; it is an anachronism in our age of canals, railroads and telegraphs; no intelligent farmer would dare proclaim it now.

There is a tendency to substitute a new principle for it, which aims at the same results. Several branches of farming, it is said, carried on by the same farmer, insures him against serious loss, because if some of these branches fail, it is not at all probable that all of them will. France applied this system to both vegetable and animal productions, but progress in industry began only when labor was divided, when masters and mechanics were confined to a single operation. Since division of labor was so useful to industry proper, it cannot fail to be profitable to agricultural industry, which is so difficult and complicated, and acts upon living beings by means of agents so little known and entirely out of our control. England affords a proof that division labor possesses great advantages. No system of agriculture is so simple, so perfect, so profitable as the English; there are farms where sheep only are raised; others produce nothing but milk, or butter, or cheese; in other places they breed oxen and horses only; some are devoted entirely to the fattening of stock.

In France we see districts and villages become prosperous as soon as they adopt an exclusive occupation. In the country of Cotentin and Bray, the production of butter has become very profitable; in the provinces of Boulogne and Perche, they are made rich and famous by breeding horses; Poitou obtains wealth and supremacy by its mules; exclusive branches, whatever they may be, are everywhere and always prosperous.

It is impossible that an intelligent man, who concentrates all his energes on one branch of business, may not attain ultimate success; therefore the necessity of simplification in agricultural pursuits, and the adoption of as few branches as possible.

We have insisted on the decisive influence which cattle exercise on agriculture. The number of animals compared with the extent of cultivated land, and with the number of inhabitants, will afford an important element in estimating the agricultural condition of a country. In the following tables, drawn by Mr. Bloch, the small animals were computed, in the due proportion of weight, to form one large one, an ox as a standard:

There were in Prussia, in 1846—

| | |
|---|---|
| Horned cattle | 5,262,093 |
| Horses and donkeys, 621,994 | 600,000 |
| Sheep, 16,236,000—as cattle | 1,623,600 |
| Goats, 395,000 " | 65,836 |
| Swine, 2,116,000 " | 352,500 |
| | 7,904,029 |

That is, 15 head of cattle for 100 acres of cultivated land, and 413 to 1000 inhabitants.

The census of 1848, in Bavaria, shows—

| | |
|---|---|
| Horned cattle | 2,625,294 |
| Horses | 349,990 |
| Sheep, 1,899,898—as cattle | 189,989 |
| Goats, 107,236 " | 17,872 |
| Swine, 842,851 " | 140,475 |
| | 3,323 620 |

Making about 26 head of cattle for 100 acres of cultivated land, and 737 to 1000 inhabitants.

n the dukedom of Baden there are—

| | |
|---|---|
| Horned cattle | 492,153 |
| Horses | 77,740 |
| Sheep, 188,707—as cattle | 18,870 |
| Swine, 481,000 “ | 80,168 |
| | 668,931 |

Being 34 head of cattle for 100 acres of cultivated land, and 484 to 1000 inhabitants.

☛ In Ohio, 1305 for 1000 inhabitants, and 31 head for every 100 acres in cultivation.

There are in France—

| | |
|---|---|
| Horned cattle | 12,000,000 |
| Sheep, 35,000,000 ($\frac{1}{10}$ as cattle) | 3,500,000 |
| Horses | 3,000,000 |
| Mules, donkeys, 900,000 as cattle | 450,000 |
| Goats, 1,000,000 “ | 166,000 |
| Swine, 5,500,000 “ | 916,000 |
| | 20,032,000 |

This gives 32 head of cattle for 100 acres of cultivated land, and 556 for 1,000 inhabitants.

There are in England—

| | |
|---|---|
| Horned cattle | 9,636,000 |
| Horses | 1,500,000 |
| Sheep, 32,000,000 as cattle | 3,200,000 |
| Goats, 210,000 “ | 5,000 |
| Swine, 4,000,000 “ | 667,000 |
| | 15,008,000 |

The ratio is, as in France, 32 head of cattle for 100 acres of cultivated land, and 528 to 1,000 inhabitants; the apparent inferiority is more than compensated by the advantage of weight.

The census in Belgium in 1846, shows—

| | |
|---|---|
| Horned cattle | 1,203,891 |
| Horses, mules, donkeys (303,929) | 296,589 |
| Sheep 662,508 | 66,251 |
| Goats, 110,060 | 18,344 |
| Swine, 52,429 | 175,405 |
| | 1,760,480 |

The proportion is 39 head of cattle to 100 acres of cultivated land and 400 to 1,000 inhabitants, which shows a dense population.

There is in Ohio more live stock, in proportion to the number of inhabitants, than in any nation of Europe. If we reduce sheep and swine to equivalents of cattle or horses, the following exhibit is obtained, according to the most recent accessible European authorities:

| | No. of cattle for every 100 acres of cultivated land. | No. of cattle for every 1,000 inhabitants. |
|---|---|---|
| France | 22 | 556 |
| England | 32 | 528 |
| Belgium | 39 | 400 |
| Prussia | 15 | 413 |
| Bavaria | 26 | 737 |
| Baden | 34 | 484 |
| Austria | 32 | 430 |
| Ohio | 24 | 1,306 |

From this it will be observed that we have about three times as many cattle, in proportion to the inhabitants, as an average of the above-named European nations.

## SHEEP.

"Has any attention been paid to sheep breeding in your county, within the past five years?

"What variety of sheep are most generally bred?

"Are there any Spanish merinos in your county?

"Are there any French in your county?

"Are there any Saxony in your county?

"Are there any Silesians in your county?

"Are there any Cotswolds in your county?

"Are there any Southdowns in your county?

"Are there any Leicestershires in your county?

"Which of these imported breeds is held in the highest estimation; and why?

"For what purposes are sheep most generally bred—for mutton or wool?

"Which varieties are considered the best mutton?

"Which varieties are considered the most profitable for mutton?

"What is the probable cost of rearing a two year old sheep?

"What system, if any, is adopted of wintering sheep?

"What diseases are most common among sheep?

"Are many lost by disease?

"What varieties appear to be best adapted to the food, soil, and climate in your county?"

Hickory Grove, London, Madison Co., O., Feb. 22d, 1862.

John H. Klippart, Esq.—*Dear Sir:* Either time has been too *precious* or *I* have been too *negligent* to reply to your queries, on sheep and wool growing, &c,

received some weeks since. I am pleased to offer you the following in review of and reply to your thirteen specified headings, and as they cover the *whole* ground, I shall not deem it politic to enlarge upon the subject at any length.

1.—Has any attention been paid to sheep breeding in your county within the past *five* years?

*Ans.*—Within that time—although our numbers are now *less* than they were in years previous to 1857, and have remained for the past *three* years *about* sixty thousand—yet the assessed and *considered* worth is now far ahead of former years, and increasing steadily year by year. Within these five years large numbers have been imported, chiefly for wool—mostly ewes—from the various north-eastern States, and from the older, more noted fine wool growers east of us, and some from Pennsylvania. Many of our larger "cattle king" farmers are adopting a mixed husbandry—keeping a few sheep with the neat stock; and a few have introduced large flocks, ranging from 2 to 3 or 5,000 each, which have supplanted the former herds of cattle. Nearly *all* are owning more or less sheep. Generally speaking, we might state that sheep raising for wool and mutton is becoming more and more generally diffused into our stock system, and is more valued than formerly, as a source of sure, profitable income.

2.—What variety of sheep are most generally bred?

*Ans.*—Spanish, or Atwood, or crosses of these; though a few yet hold on to the French, yet their numbers are decreasing year by year.

3.—Are there any Spanish merinos in your county? any French? any Saxony? any Silesians? any Cotswolds? any Southdowns? any Leicestershires?

*Ans.*—*Some* of *all*, but most of Spanish and Atwood merinos and crosses, Saxons, Silesian and Cotswolds, and crosses. Of these *four*, Spanish and Saxon, and grades of these, are by far the most prevalent. Most of our *best* flocks show more or less Saxon blood, though a *few* have pure and *nearly* pure Spanish merinos.

4.—Which of these imported breeds is held in highest estimation—and why?

*Ans.*—Generally the Spanish and crosses. Advocates of this breed urge as a wherefore, that if not so good for mutton, that they are much better for wool, producing larger, finer fleeces, commanding higher prices and quicker sales than other varieties; and besides, it is claimed, and with these best of reasons too, viz.: *facts* to sustain them, that the heavier, more valuable the *single* clip, the cheaper, easier kept. This is, to my mind, demonstrable. The heavier, more compact the fleece, the better it will resist cold and rain, and the better *retain* animal heat, requiring *less* food than the more open, lighter fleeced animal of *any* breed.

A few are yet found—men who *always* resist innovation or practices of their forefathers—who yet cling to the small, puny carcass of the in-and-in-bred degenerated Saxon in its *purity*. The Silesian advocates are but few among our intelligent growers, and yet we have a *few* who can see *nothing* desirable except it weighs 140 to 150—no matter how open or light the fleece—and will consume as much as a yearling neat animal.

But these are the exceptions, not unusual in any community or county. *Most* of our farmers are intelligent, and ready and waiting to adopt *any* breed that pays best for *all* purposes.

5.—For what purposes are sheep most generally bred—for mutton or for wool?

*Ans.*—For both in *part*, but wool is the main object. Our best growers claim that a good wooled sheep is *always* desirable for mutton when *undesirable* longer exclusively for clip. I am of that number, and hoot at the idea, advanced by a few, that nothing is desirable for mutton except it be coarse wooled. I defy any mutton epicure to detect the *breed* by *eating* mutton only, knowing nothing of its antecedents except from the taste.

6.—Which varieties are considered the best mutton?

*Ans.*—Spanish and Southdowns.

7.—Which varieties are considered most *profitable* for mutton?

*Ans.*—Southdowns and Cotswolds, and crosses on Spanish or French, but the former first; cross *equally* as desirable as the full blood. Will command as much market price to ship.

8.—What is the probable cost of raising a two-year old sheep?

*Ans*—This is a rather difficult query, as it will depend on the breed and raiser. I should say, for a Spanish or cross, or Saxon or Silesian and crosses, that the *actual* cost would not exceed one dollar to one dollar twenty-five cents per head, though the usual standard for pasturing sheep is *ten* cents per month for winter (our savannahs permit range to grass *without* other feed or attention generally, requiring but a few days or at most weeks feeding during winter—often none at all), and from six to eight cents per head for summer—say an average, year round, of seven to nine cents per head per month. This rate pays a good price per acre for grass. Fine-wooled sheep are generally reckoned *ten* to equal one three-year old steer in grazing (steers range from 75 cents to $1 25 per head per month during pasturing season), though a *few* consider this estimate as too low, and that eight sheep will equal one neat full grown animal. I agree with this latter class.

Of the *larger*, coarser wooled varieties, we add one-fourth or one-third, or consider that these breeds will consume that proportion of grass in *excess* of the before-mentioned smaller animals.

9.—What system, if any, is adopted of wintering sheep?

*Ans*.—Usually they are allowed grass range, year round, feeding a little corn fodder or hay, or fodder and ear corn in very bad weather, or when snow is too deep to permit them to reach grass by "pawing off." With a sufficient range, sheep will come out in spring in fine condition.

Within a few years past a few of our best flock-masters have adopted the plan of keeping up in sheds or small lots, and feeding cut-feeds instead of allowing animals range, as above suggested. But by far the larger majority furnish no shelter except groves of timber or hazel thickets.

With good range and plenty of grass they are not liable to diseases of any kind, and the mortality is generally smaller than if confined, especially if kept in large lots together.

Dogs are the greatest drawback to this full range system. Near towns, this is impracticable on account of these numerous, worthless vagabonds, which infest our villages by scores. When will our Legislature give us demanded protection?

10.—What diseases are most common among sheep?

*Ans.*—Most prevalent and *fatal*, Dogs. A *few* are starved to death, or die of *old age*. A few years since, "the scab" was quite prevalent, but within two or three years past it is about exterminated. Occasionally, "worm in the head," from egg deposited in the nose in dry weather of August and September, which eventually changes to a small white maggot, and reaches the brain. Have found as high as a dozen in brain after death from this cause. Frequent and plentiful applications of tar to nose of sheep during summer months will prevent these from being deposited.

11.—Are many lost by disease?

*Ans*—This is answered in the main in No. 10 above. Aside from *dogs* (which is a disease), but few are lost.

12.—Which varieties are considered the hardiest?

*Ans*—Spanish and French and crosses of the finer wooled varieties; and so far as I am aware, but little difference is recognized in the long wooled kinds on this score.

13.—What varieties appear to be best adapted to the food, soil, and climate of your county?

*Ans.*—In former Nos. above answered this query is mainly considered. Our best breeders view Spanish or Atwood pure, or crosses, in this light. Perhaps the French are as well suited to the soil and climate as any others, but not so desirable; in fact, I firmly believe *any* of the recognized varieties will do well with us, with proper care and attention. But the breed producing the *most* wool (without regard to *weight* of carcass), at the least expense of mortality and feed, and that wool of a good quality, is *undoubtedly* the most desirable, most profitable, and best suited to a general sheep husbandry.

Although much has been said in favor of the Silesians in many sections—although many are pinning their whole faith to these as the *desideratum*—they have never, and *never will*, find favor in the eyes of our more intelligent sheep husbandmen. The carcass is not larger or more hardy than the Spanish or Atwood; the wool is *not generally* of *finer* fibre; and the fleece will never *equal* these latter in weight. It has never been demonstrated that they can be more easily kept; and until some more convincing proofs of their superiority are developed, I see no valid reason for their superseding our older, well tried, hardy, profitable Spanish and crosses.

The wools of our county are generally light and clean. The out-door general system of keeping develops these desirable qualities to a buyer or manufacturer. They are generally eagerly sought after by these classes, going mainly to the New

England mills, though considerable quantities are home manufactured each year, in families and in local mills for this purpose, in our own county, at Springfield, Columbus, Dayton, and perhaps other places. Circleville takes considerable quantities from the southern part of the county.

Some of our best flocks reach an annual average of 4½ to 5 lbs., but the *whole* clip of the county will not exceed 3½, if it will quite reach this figure, one year with another. Last year (1861) the weight fell below year previous (1860), mainly, doubtless, on account of cold backward spring before clipping, grease being but little developed.

Our large savannahs, large farms, and adaptedness of soil to best grasses, with open winters, are favorable to sheep husbandry.

This branch of intelligence is advancing, and ere long I trust our county will occupy a rank in sheep and wools second to none in *quality*, if not in *quantity*.

Truly,

IRVING F. WILLIS.

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NEW ATHENS, Harrison county, O.

MR KLIPPART, ESQ.—*Sir:* Your series of inquiries have come to hand, and I will answer them to the best of my ability.

1st.—Has any attention been paid to sheep breeding in your county within the past five years?

This county has been engaged in sheep-breeding and raising for a number of years. The sheep of the county, at the present time, differ materially from those of former years. During the last five years there has been a great improvement in sheep-breeding. The quantity of wool has been increased fully one-fourth per head, without materially decreasing the quality. This county is not excelled by any county in the State for the amount of good wool produced. There is at the present time about one hundred and forty-four thousand sheep in the county. They will average four pounds of fine wool per head.

2d.—What variety of sheep are most generally bred?

The principal breeds of the county are Silesians and Spanish Merinoes. Each of these varieties have their friends, and each claiming to have the most profitable variety; but this does not settle the question. Time and experience can alone do this. Several persons in the county are still breeding Saxony sheep: this variety was the prevailing variety seven years ago in this county. French sheep were introduced in the county about seven years ago, but have gone by the board. There are a few Cotswolds, Southdowns and Leicestershires bred in the county; but these varieties are very limited. Sheep are most generally bred for wool, though there are a great many fed for mutton. The fine wooled varieties are generally considered the most profitable for feeding, as we can make as many pounds of mutton to the bushel of corn with the fine wooled as with the coarse wooled, the former having the most valuable fleece. The cost of rearing a two year old sheep is about $3.25. Some rear them for less, but they are not kept right. Lambs, when they are weaned, should be fed regularly twice a day with a little oats, bran and corn. They will then come into winter quarters in good condition. All prominent sheep-breeders have a sheep-house, in this they have racks in which the hay is put. Sheep that are fed under cover do better, and eat their feed up cleaner, than when fed otherwise. Yearlings and two year old sheep are fed about the same quantity—say about one bushel of corn and oats mixed (equal parts) to seventy-five head per day, with plenty of good hay. Feeding the above quantity to good sheep, we expect them to look right, and pay well.

We have had some foot-rot and scab in this county, but to a very limited extent. Upon inquiry I can learn of no cases of either foot-rot or scab in the county at the present time.

The climate, soil and food of this county is adapted to any variety of sheep, as the land is generally rolling, and produces timothy, clover and blue-grass in abundance.

JOHN SINGER.

FULTON, Stark county.

1st.—Has any attention been paid to sheep-breeding in your county within the past five years?

*Answer.*—There has. Stark can boast of as good sheep, perhaps, as can any other county of the State; and her people are fully awake and alive to all the improvements in sheep and sheep husbandry. In this county are to be found, in their purity, many of the descendants of the justly celebrated Wells and Dickinson stock of Merino sheep.

2d.—What variety of sheep are most generally bred?

*Ans.*—There are more of the Merinoes bred in this county than of any other variety, or, perhaps, more than of all the other varieties together.

3d.—Are there any Spanish Merinoes in your county?

*Ans.*—There are a good many.

4th.—Are there any French Merinoes in your county?

*Ans.*—There are a few.

5th.—Are there any Saxon Merinoes in your county?

*Ans.*—There are but few. Ten years ago the Saxon Merinoes were the most numerous of the fine wooled sheep of the county, but are now nearly or altogether bred out.

6th.—Are there any of the Silesian Merinoes in your country?

*Ans.*—Not any that I know of.

7th.—Are there any of the Cotswolds?

*Ans.*—I know of but a few.

8th—Are there any of the Southdowns?

*Ans.*—There are some, but not a great many.

9th.—Are there any of the Leicestershire in your county?

*Ans.*—There are a good many, but perhaps not many pure bred.

10th.—Which of these imported breeds are held in the highest estimation, and why?

This question may have as many different answers as men have different notions and opinions. To the flock-master, who breeds and keeps sheep for the wool principally, the Spanish Merino is esteemed above any other in this climate. Some of the reasons for which are as follows:

1st. The Spanish Merino produces a greater quantity of wool, in proportion to the size of the carcass, than any other variety of sheep.

2d. It is a generally admitted fact, that all animals consume food in proportion to the weight of carcass. This being the case, and the difference in weight between a Spanish Merino and a Leicestershire or a Southdown being about one-third, it will readily be seen which of the two varieties is most profitable for wool; for, generally, it will be found that the well-built, close and compact Spanish sheep of eighty pounds weight will produce more pounds of wool than the Leicestershire or the Southdowns of one hundred and twenty pounds. If this be true, it requires one-third more feed to produce a pound of wool from a Leicestershire or Southdown sheep than it does from a Spanish Merino; while, at the same time, a pound of the Spanish Merino is worth and will sell for at least one-third more than the other.

Another reason why the Spanish Merino is more desirable than any of the light-wooled varieties is, that the wool is generally very compact and close, and being oily, as well, protects the bodies of the animals from the inclemencies of the weather; while the loose, open and light wooled varieties, when exposed to the rains and storms, the wool becomes saturated, the water finds its way to the skin, the animal takes cold, and perhaps dies from the exposure.

Another reason why the husbandman who keeps sheep for wool prefers the Spanish or some other of the Merinoes is, that they herd together in large flocks better than the Leicestershires, or Cotswolds, or Southdowns. They are, perhaps, the most quiet and docile variety of sheep of all others. This to the flock-master is a great consideration.

But to the flock-master who breeds and keeps sheep principally for mutton, I think the Leicestershires, Southdowns or Cotswolds may be preferable. But I know of no person in our county who breeds and keeps sheep exclusively for mutton. Indeed, I am of the opinion, that most of these mutton varieties of sheep are raised by the millions of farmers who keep, perhaps, but from ten to fifty head of sheep, and pay but little attention to them at any season of the year. Their principal attention is turned to growing wheat and other grain, and keeping a good supply of horses and cows, with a few sheep to trim out the fence corners, and these few are generally the larger and rougher varieties and take care of themselves, generally dropping their lambs about mid-winter; and each year the owner permits the buyer to enter his flock, and select for the market such as he wants. I give it here as my opinion, that a man could not take and keep a large flock of these sheep, and make it as profitable, as he can a flock of the Merinoes.

11th.—For what purpose are sheep most generally bred—for mutton or for wool?

*Ans.*—For wool principally.

12th.—Which variety is considered the best mutton?

*Ans.*—There are differences of opinion upon this question—some maintaining that the Leicestershire variety produces the best mutton; others the Southdowns; while many others contend that the Merino makes as good mutton as any of the coarser wooled varieties, though not so much of it.

13th.—What is the probable cost of rearing a two year old sheep?

*Ans.*—I think, perhaps, about three dollars.

14th.—What system, if any, is adopted of wintering sheep?

*Ans.*—Every experienced Flockmaster of the county is provided with a good warm, comfortable sheep house. It is generally closed tight and close, and three sides, with an open front, from six to eight feet high. The sheep are inclosed by the use of hurdles to said open front. The interior of the sheep house is well supplied with racks, designed for feeding both hay and grain, or either. The sheep are divided into flocks of convenient number by the use of said racks, which are light, and can easily be shifted from place to place by a man and boy, or two persons. The number of yards in front of the sheep house should correspond with the number of flocks designed for the sheep house. This is indispensably necessary in order to convenient feeding. For previously to beginning to feed they should all be turned into their respective yards, there to remain until the feed is all placed in their racks or troughs. The most of the flocks are kept on hay and straw during the winter, excepting ewes and lambs, perhaps, which are also generally fed oats and shorts or bran, particularly the latter part of the winter and spring. I will say also that every good Flockmaster has his sheep furnished daily, in their winter quarters, with a good supply of clear pure water. I think water as indispensably necessary to the welfare of a flock of sheep as food; at all events they cannot do without it and do well, or even middling well.

15th.—What diseases are most common among sheep?

*Ans*—Perhaps foot-rot, or hoof ail, is the most common; although I think there is but very little of it, if there be any, in the county. It prevailed very extensively at one time, and for a number of years in this county, but Flockmasters finally took hold of it with energy, determined to rid their flocks of it if there could be any such thing, and they were entirely successful. Another disease incident to the sheep is the scab, and there have been a few cases of it in this county, but it has not prevailed to any great extent. I consider this disease by far the most to be dreaded, by Flockmasters, of any other disease incident to the sheep in this country. There is, perhaps, no disease which is so contagious among sheep as this; and if the time should ever arrive when this disease becomes general among the flocks of this country, the raising of sheep, as a business, would probably have to be abandoned altogether. Another disease, perhaps as common among sheep as any other, is the rot. This disease is brought on by keeping sheep too long, in the latter part of the summer and fall, upon low, wet, marshy ground. It is not good to keep sheep, for any great length of time, upon such pastures without changing them every few days to high and dry pastures. When this disease is fastened upon the system the sheep might as well be killed at once, for it will drag out a miserable existence without any profit to its owner.

16th.—Are many lost by disease ?

*Ans.*—I think not. In a period of twelve years last past, my loss, from all causes, has not exceeded five per cent. of the flock; while my gain has been twenty-five per cent.

17th.—What varieties appear to be best adapted to the food, soil, and climate in your county ?

*Ans.*— I do not know that there is any difference. They are admirably calculated to all varieties of sheep.

Respectfully, &c.,
WM. M. CUNNINGHAM.

## MULES.

Mules are raised more or less in most parts of the State, but hitherto they have mostly been sold to southern markets rather than used at home. Their general use, however, has increased slightly within the last five years. Their freedom from disease, length of life, ease and cheapness with which they can be kept—strength and ability with which they endure hardships, and adaptation to certain kinds of labor, will tend to bring greater numbers into use in future. For teams on the road, for mowing and reaping machines, and for the purpose of cultivating corn, potatoes or other field crops, they surpass horses. There is always one satisfaction in using mules, and that is, there is no fear of over-working them. They should be well trained and worked steadily.

## HOGS.

The interest of Ohio in hogs amounts to several millions of dollars annually. In the corn growing region they are raised largely for export, some counties selling nine-tenths of all they grow. In the grass and dairy parts of the State, the amount of pork exported is less, but even here it is considerable, and the profit is at usual prices large, because they consume so much refuse of the dairy and kitchen which in no other way could be converted into valuable material.

**Breeds of Hogs.**—The hogs of the State are classified into the large and the small breeds. Of the large breeds we have the Chester White, the Liecestershire, the China hog and the Russian, besides the usual mixture of all breeds. At present the most popular are the Chester Whites and the Liecestershire. The former are very large framed animals, feed well, and when fattened will dress from five to six hundred pounds. The Liecestershire are not so large boned, and possess a remarkably round and full barrel, dress about the same as the Chester

Whites, and though not as yet so generally diffused, are probably equally valuable. Of small breeds the Suffolk is the most popular, being small boned and fine grained, easily fattened and early to mature Where farmers raise pork for their own use only, and wish a choice article, the Suffolk is generally kept. Where feed is abundant, and pork is raised largely for export, the larger breeds are more frequently found. The common but mistaken opinion among farmers that a cross between different breeds of animals always results in improvement, has led to frequent crosses between the small and the large breed of hogs with a view of increasing the size of the former and improving the quality of the latter. If such mixture could always be confined to the first cross, in many instances it might be an advantage, but after this the results are very uncertain.

COST OF RAISING A HOG TO THE AGE OF ONE YEAR.—We have no reliable data for determining what it costs to rear a one year old hog. Farmers generally keep no account of such things. Where allowed to run at large without more feed than they can gather for themselves, unless the mischief they do is counted, they do not cost much; where kept growing from the time they are taken from the sow till a year old, they may be made to cost from six to fifteen dollars, according to the value of the food given them. It is a very common practice among farmers who keep few swine to kill them at the age of one year or a little less. Where this is the case they are forced with all the food they can eat, and of course cost more than if allowed only their natural development. A hog will cost more or less according to the manner in which he is kept, and there is a wide difference between the extremes. So far as profit is concerned, the plan of keeping them growing rapidly, though not forcing them, is undoubtedly the best.

HOW MUCH CORN DOES IT TAKE TO MAKE A POUND OF PORK?—Of course this depends very much on the manner in which the hog is fed. If warmly and cleanly kept, and not allowed much room, the quantity is much less than when they are allowed exercise and exposure to cold. A certain amount of the food given any animal must be expended in keeping up his heat. If we limit the amount necessary for this purpose by dry and warm pens, whatever is saved in this way will go to increase the quantity of fat laid on or deposited in the cellular tissue; so if the amount of exercise taken be great, the change of tissue in the muscles and the increase of respiration is so great that a large share of the food taken will be consumed in carrying on these functions. As most frequently kept, it takes about five pounds of corn to make one pound of pork. Where the food is cooked, a saving of about twenty-five per cent is made. There is a limit, however, beyond which saving food from being used for the wants of the system to be converted into fat cannot be carried. The power of storing up fat depends largely on the ability of the system to digest food well, and this to a certain extent is determined by the amount of exercise taken and the quantity of air breathed. If we diminish these below the amount necessary for perfect health, we destroy the ability to digest food and to form healthy tissue.

HOG CHOLERA.—This disease has appeared in many parts of Ohio. From returns we have, about fifty counties have suffered more or less from its ravages.

Though distillery-fed hogs have suffered most, yet it has not been confined to them. It may seem a remarkable fact, but it is true, that in scarcely a county where pork is not exported has this disease appeared; and where it is very largely exported the disease has been most common. As to the causes of the disease, there are many opinions, but a majority of farmers usually ascribe it to some unknown cause. Where large numbers of swine are massed together, where they are confined in cold, damp and shaded positions, and where they eat largely of unwholesome food, there is most of this disease; and the causes of it will much more likely be found in some of these conditions than elsewhere. Of the different methods of treating the disease, none have been very successful. Removing the animal to clean, dry, healthful places, and letting him alone, has succeeded full as well as special treatment.

Of all our domestic animals, the hog is subject to the most abuse. Not that he does not have sufficient food, but the condition in which he is kept is entirely contrary to his nature, and prevents the healthful exercise of his natural instincts. Very much has been said by medical men and others, and rightly, against the use of pork, because, say they, it is almost always more or less diseased. How can it be otherwise than diseased when the instincts of the hog are so completely annulled? A writer in the Mark Lane Express says: "*Exercise, light, and pure air* are essentially necessary to the proper development of healthy, juicy, lean meat, and also of healthy fat;" and yet swine as almost always kept are deprived to a great extent of all of these conditions. We deprive him of exercise that he may not work off the corn given him, and yet in so doing we prevent free respiration, by which only the blood is purified, and vigorous circulation, by which only the most healthful tissue is built up. There is no escaping this conclusion, unless we set at naught the well established principles of animal physiology. Pure air is also equally important, otherwise the blood is constantly being loaded with matters productive of disease. Pure air for the hog in a pen or yard where his own excretions accumulate from day to day, is out of the question. It needs only the testimony of the olfactories of any one passing near almost any stye to determine this. The hog by nature inhabits the woods, where he has abundant exercise to procure his food, pure air, and, never being confined, does not suffer from the accumulations of his own excretions. In domesticating him we should not forget his nature. It is very true that the present mode of fattening swine gives more pork to the pound of corn than that plan which would give them health; but, compared with its value, this would be of no account. There is reason to believe that less pork is used in Ohio in proportion to the population than formerly. The facility of the farming population for obtaining fresh beef and mutton being better, its use is taking to some extent the place of swine's flesh.

## POULTRY.

Since the subsiding of the "Hen Fever" which swept over the country like an epidemic a few years ago, people have been content to "make haste slowly" in the improvement of their poultry. We have no means of knowing the amount or value of this property in the State. The profit received from it annually is, however, sufficient to make it a matter of importance that statistics be gathered yearly in regard to the number and value of hens, turkeys and geese. Along the lines of our principal railroads there is reason to believe that there has been an increase in the number of hens and turkeys kept within the last five years. In no instance, however, has it become a leading branch of business. The real profit from poultry will always be most where they are kept in small quantities by a large number of people, rather than the reverse. They are important to the farmer from the large number of insects they destroy, and might be made so for the value of the manure which could be saved from them, were it not usually allowed to go to waste. Within a few years the Bronze Turkey has been introduced into the State, and very favorable reports are given of their value. Of hens no new breeds have recently been introduced, but there has been a general dissemination of the most valuable old breeds. Rearing geese is on the decline, and has been since the substitution of mattresses for feather-beds in so many families.

## BEES.

Bee culture has received a very decided impetus within the last five years. Previous to that time it had been on the decline. The ravages of the bee-moth (*Galleria cereana*), which in the caterpillar state feeds upon the comb of the bee, the loss from wintering them, and the great number of patent hives, which were either so many moth traps, or which, in construction, made wintering bees more uncertain than ever, all tended to this result.

HIVES.—Since the introduction of the Langstroth hive, which gives the bee-keeper such control of his bees that he may at any time ascertain their condition and wants, the difficulties of keeping them have been so materially diminished, that hundreds who before kept them only that they might enjoy the luxury of honey, now have so increased their swarms as to make them a source of profit. Especially is this the case with those persons who live near towns and own but little land, and with professional men, who find in their care not only profit, but that relaxation from their labors so necessary to health. It may safely be said that the Langstroth hive has to a great extent supplanted all others in this State, and is producing a revolution in this department of industry. Without it, or some hive that gives perfect control of the bees, much of that vast amount of sweet found in so many of our trees and flowers would never be gathered Bee-keeping is not confined, however, to professional men or those who live near cities; many farmers throughout the State keep large apiaries, from which they derive considerable income.

WINTERING BEES—There has always been great loss in wintering bees. Even with the present improvements in keeping them, about one-fourth of the number of colonies kept perish during the winter. Those which are lost, however, are commonly the least valuable swarms, and it will not be understood that one-fourth of the value of our bees is lost in this way. One important principle in wintering them has been settled, and that is, the hive must have sufficient ventilation. Bees take in oxygen from the air, and give out carbonic acid gas; and unless this is allowed to pass off, and fresh air to take its place, they are poisoned by it, and perish. So, too, if the moisture which accumulates in a hive during certain states of the atmosphere be confined when it becomes sufficiently cold to freeze it, the bees suffer greatly.

Burying bees during winter has been tried by a few apiarians, and, if done properly, it has been successful. If not done with the greatest care, however, the result is just the reverse. Removing them to a dry cellar, where the temperature is above the freezing point, has been highly recommended by some apiarians, who have derived good results from the practice. The advantage of these methods is that less honey is required in wintering them than when exposed to the cold, and less liability to loss. They also produce earlier swarms.

**Amount of Honey per Colony.**—Some seasons, as that of the present year, bees produce little surplus honey. Other years the amount laid up beyond their own wants is very great. Occasionally from 75 to 100 pounds have been taken from a single hive. The average amount, however, as given by leading bee-keepers, is about 35 pounds. The price of honey varies with the locality and the supply, and ranges from ten to twenty cents. The most common and average price for good honey is from fourteen to eighteen cents. To the question, "Is bee-keeping in Ohio considered profitable?" the answer is, "*With proper care*, YES."

## APPLES.

"Has the apple crop been successful in your county within the past five years?

"What are the causes of the failure of the apple crop?

"Have any new varieties of apples been introduced within the past five years; and if so, what are they, and how do they succeed?

"What varieties are most generally grown in your county?

"What are considered the best six autumn varieties?

"What are considered the best six winter varieties?

"In planting a new orchard in your county, what ten varieties of winter apples would you recommend? What ten varieties of autumn apples?"

If the counties in the State in which the apple crop has been a successful one for the last five years were numbered, they would not exceed fifteen. The number in which the crop has been partially successful, however, is large, and in but a small number has there been a total failure.

**Causes of Failure.**—The most frequent cause of the failure of the fruit crop in Ohio is spring frosts. On the lake shore this evil is not frequent, on account of the modifying influence of the water upon the atmosphere. Our most successful counties for apples are those bordering Lake Erie. There are portions, however, of almost every county—where the land is elevated—in which fruit is almost as secure from frost as in this region. As frosts are beyond our control, we can do little to prevent injury, further than to plant our orchards in such situations as are as little liable to them as possible. In a few instances farmers have tried to prevent them in the immediate vicinity of their orchards by building fires, but these attempts have usually failed. A better way would be to construct small furnaces from which a current of heated air could be sent among the branches of the trees. It would take but little warm air to keep the fruit from freezing, if properly applied. A cow lying under an apple-tree, where her breath ascended among the branches, has saved the fruit when all the other trees of the orchard have had theirs killed; a single hog sleeping under a pear-tree has produced a like result; and yet the amount of heat generated from these animals has been no more than could be produced from a few pounds of wood.

Another cause of great injury to the apple crop throughout every part of the State is the apple-worm. The eggs from which these worms are hatched are laid by the codling-moth (*Carpocapsa pomonella*) during the months of June and July. The windfalls, or worm-eaten apples, that drop in the stillest weather, have each one of these worms in the core. The eggs of the moth are laid in the eye or blossom end of the fruit when quite tender, in thin-skinned and early rather than late apples. The eggs hatch in a few days, and the worm works its way to the core. The round hole through the side of the apple is not the place of its entrance, but where refuse and voidings are thrown out. The most effectual method of waging war against them is by gathering and feeding to hogs the apples which fall early, and by keeping the bark of the tree clean and healthy, so no place will be found on it for them to undergo their transformations. The worms conceal themselves under loose pieces of bark on the tree; and if these be scraped off, and the trunk washed with lye in early spring, many of them will be destroyed.

Until within a few years the canker worm (*Phalana vernata*) had not been common in Ohio, but now in very many counties considerable injury has been done from them. The eggs are laid in winter and spring, on the twigs of the apple-tree, in clusters of from fifty to one hundred in number. In May they hatch, and the young worms feed upon the leaves and fruit of the tree; and frequently they exist in such multitudes that the entire foliage is destroyed, when the tree looks as if it had been severely scorched with fire. We have not heard of any successful attempts to prevent their ravages in Ohio, but from the nature of the insect, the most effectual means will be found in preventing the female moth—which is wingless—from crawling up the body of the tree to deposit her eggs. The best method of doing this is to place around the tree a circular leaden trough containing oil, over which they cannot pass. The trough should be fitted upon a mat made of fine straw, with the ends cut squarely off, so as to prevent a ragged front to them.

Still another cause of a partial failure of the apple crop may be found in the excessive bearing of trees in years of abundance. If from any cause the fruit crop fails one year, the succeeding season is likely to be followed with overbearing, which so uses up the energies of the tree that little growth of wood is made. The year following overbearing will be followed by a failure of the crop, the life of the tree going to promote its growth.

Thousands of the old apple orchards of the State, from neglect and other causes, are going to decay. Large numbers of young trees have been planted to take their places. As a general thing, these young trees are not growing so vigorously as the first plantations. There are two reasons for this. First, Orchards set out when the country was new, had an unexhausted virgin soil full of vegetable mold, from the decay of leaves and forest trees for centuries. Such a soil produced a thrifty, healthy growth. Now they are too often planted in a soil exhausted of this virgin richness by the production of grain, and before the tree can get a start it dies from starvation. Second, The trees planted then were raised from seed planted in similar soil, on the farmer's own land, or in his own neighborhood, and received a healthy growth. None were transplanted unless they were thrifty; now too often they are improperly grown in some nursery where the main object is to sell trees, rather than to sell only such as will produce vigorous orchards. But little of the blame, however, belongs to nurserymen; for it they were always well cared for by proper planting and after care, even if not well grown, most of them would live and produce well. The largest share of the fruit trees planted within the last ten years in Ohio, have died for want of proper planting and protection during their first few years' growth.

CROPPING ORCHARDS.—The practice of cropping orchards is quite a common one in Ohio, not every year, but at intervals of five or six years. Sometimes wheat, sometimes oats or corn are grown. During these intervals they lie in pasture, or perhaps are mown. There is great difference of opinion as to the advantages or disadvantages of the practice. Those in favor of it, argue that it does not exhaust the soil more to remove a crop of grain than of grass, or allow it to be fed with cattle or sheep; and it is claimed that plowing loosens the soil, and allows the free penetration of the roots, moisture and air. There is a growing disposition, however, to abandon the practice, or resort to it less frequently. The great injury done to the roots, and the large amount of food for the tree removed by the crop, being considered arguments against it. Young orchards, however, are commonly cultivated until they are well established.

PRUNING ORCHARDS.—One of the worst practices farmers have been led into throughout the State, has been of removing the large lower limbs of trees fully grown. Such trees never recover from such surgery. The practice is, however, being discontinued by all intelligent farmers, and trees are being cultivated with much lower heads than formerly. It has been observed that very many trees with long stems unprotected from the sun in hot weather, that the trunk became so unnaturally heated as to kill the bark and wood in these exposed parts. Trees pruned with low heads are protected by their own shade from this injury.

HOGS IN THE ORCHARD.—The practice of allowing swine to run in the orchard is still continued by a few farmers in different parts of the State. The arguments advanced in favor of it are, that they destroy the worms that exist in the windfall fruit, and thus prevent their increase. Well-bred swine do not root sufficient to do injury, nor hurt the trees. A very few hogs are sufficient for the purpose, and they are removed when the apples begin to ripen. The principal objection to the practice is the uncleanliness they occasion. Swine kept in this way grow well, and are much more healthy than when kept in confined, uncleanly pens, with neither exercise nor pure air.

Notwithstanding the apple crop in the State is not always a sure one, with care in selecting localities, and varieties adapted to the soil, and proper care of trees after they are planted, it is a source both of wealth and of pleasure to the farmer, and their growth is gradually on the increase. As an article of food, they are becoming more highly prized every year, and contribute largely to the health of the people. When abundant almost every one, in either city or country, lays by a store of them for winter as surely as he does of potatoes; and when scarce they command so high a price that persons owning land in places where the crop is a sure one, cannot do better than to plant largely of trees. At such times they are a source of great profit.

## APPLES.

The following answers have been received from the several counties named below, to the questions:

1st. Which are considered the best six varieties of winter apples?

2d. Which are considered the best six varieties of autumn apples?

3d. Which are considered the best ten varieties of winter apples?

4th. Which are considered the best ten varieties of autumn apples?

5th. What varieties are generally grown?

### BEST TEN VARIETIES OF WINTER APPLES.

**Athens.**—Roxberry Russet, Romanite, Pearmain, Pippin.

**Brown.**—Milam, Pryor's Red, Wagoner, Rawle's Janet, Newtown Pippin.

**Carroll.**—Rambo, R. I. Greening, Roxberry Russet, Milam, Northern Spy, Baldwin, Newtown Pippin.

**Columbiana.**—Fallawalder, Nonpareil, King of Tompkins Co., Blue Rambo, Northern Spy, Roxberry Russet, Canada Red.

**Defiance** — Spitzenberg, R. I. Greening, Peck's Pleasant, Northern Spy.

**Hancock**—Paradise, Winter Sweet, King, Culp, Ladies' Sweet, Rambo, R. I. Greening, Baldwin, Golden Pippin.

**Huron.**—Baldwin, R. I. Greening, Red Canada, Peck's Pleasant, Detroit Red, Seeknofurther, King of Tompkins Co.

**Knox.**—Winter Rambo, Spitzenberg, Fallawalder, R. I. Greening, Pennock, Tulpahocken Russet.

**Lucas.**—R. I. Greening, Baldwin, Spitzenberg, Roxberry Russet, Seeknofurther, Northern Spy, Talman Sweeting, Tulpahocken.

**Lake**—R. I. Greening, Roxberry Russet, Baldwin, Northern Spy, Peck's Pleasant, Mammoth Pippin, Danver's Sweet.

**Lawrence.**—Pound Royal, Rawle's Janet, Pryor's Red.

**Morrow.**—Pearmain, Ladies' Sweet, Vandever, Swaar, Rambo, Northern Spy, R. I. Greening.

**Monroe.**—Pearmain, Ladies' Sweet, Rawle's Janet, Golden Russet, Roxberry Russet, Baldwin, Newtown Pippin, Pryor's Red.

**Richland.**—Red Canada, Rambo, Peck's Pleasant, Rawle's Janet, Swaar, King of Tompkins Co., Ladies' Sweet, English Sweet.

**Stark.**—Newtown Pippin, Russet, Rambo, R. I. Greening, Romanite.

**Van Wert.**—R. I. Greening, Rambo, Roxberry Russet, Baldwin, Seeknofurther, Northern Spy.

**Warren**—White Pippin, Rawle's Janet, Milam, Wine Sap, Spitzenberg, Roxberry Russet, Golden Russet.

### BEST TEN VARIETIES OF AUTUMN APPLES.

**Athens.**—Strawberry Russet, Rome Beauty.

**Brown.**—White Bellflower, Rome Beauty, Smith Cider.

**Columbiana.**—Sweet Rambo, Fall Pippin, Gates, Hawthorn, Rome Beauty.

**Carroll**—Gates.

**Defiance.**—Yellow Bellflower.

**Hancock.**—Bellflower, Porter, Mt. Pleasant, Rome Beauty, Golden Sweet, Risley Pippin, Gravenstein, Orange, Mountaineer.

**Huron.**—Hawley Russet, Yellow Bellflower.

**Knox.**—Bellflower.

**Lake**—Belmont, Nonsuch, Gravenstein, Black Apple, Red Streak, Summer Pearmain, King of Tompkins Co.

**Lawrence.**—Summer Sweet, Summer Queen, Cooper, Fall Pippin, Rome Beauty, Gravenstein, Smith Cider.

**Lucas.**—Belmont.

**Morrow.**—Cooper, Gates.

**Monroe.**—Rome Beauty.

**Richland.**—Fall Pippin, Gravenstein, Maiden's Blush, Smith Cider, Porter.

**Stark**—Black Apple.

**Van Wert.**—Maiden's Blush, Bellflower, Fall Pippin, Gravenstein, Porter, Gates, Nonesuch, Hawley.

**Warren.**—Fall Pippin, Native Pippin, Summer Queen, Benona, Smith Cider, Bellflower, Maiden's Blush.

### BEST SIX VARIETIES OF AUTUMN APPLES.

**Athens.**—Bellflower, Rambo, Astmore, Cooper, Lady Washington.

**Ashland.**—Rambo, Seek-no-further, Tulpehocken, Sweet Russet, Hubbardtown, Nonesuch.

**Brown**—Cooper, Fall Pippins, Golden Russet, Porter, Rambo and Wine.

**Carroll.**—Rambo, Gates and Bellflower, are considered good fall apples.

**Columbiana.**—Nonparel, Gates, Sweet Bough, Fall Pippin.

**Geauga.**—Rambo, R. I. Greening, Peck Pleasant, Spitzenberg, Roxberry, Russet.

**Hancock.**—Rambo, Gravenstein, Golden Sweet, Fall Pippin.

**Huron.**—Porter, Fall Pippin, Gravenstein, Golden Russet, Jersey Sweet.

**Jefferson.**—Gates, Rambo, Spitzenberg, Maiden Blush, Winter Greening and Pearmain Sweet.

**Jackson.**—Fall Pippin, Porter, Rambo, Maiden Blush, Pearmain.

**Knox.**—Rambo, Wine, and several others.

**Lucas.**—Fall Pippin, Hawley, Rambo, Golden Sweet.

**Lake** —Red Astrakon, Golden Sweet, Maiden Blush, Golden Pippin.

**Lawrence.**—Cooper, Fall Pippin, Pound Pippin.

**Montgomery.**—Rambo, Pippin, Maiden Blush, Sheepnose.

**Morrow.**—Pumpkin Sweet, Fall Pippin, Autumn Strawberry, Tompkins Co. King.

**Medina.**—Rambo, Wine, Queen Ann, Pie, Tart and Sweet York.

**Noble** —Rambo, Bellflower, Cooper, Fall Pippin.

**Richland.**—Rambo, R. I. Greening, Gates, Pennock.

**Summit.**—Queen Ann, Fall Pippin.

**Stark** —Rambo, Gates, Pippins, Bellflower.

**Trumbull.**—Maiden Blush, Rambo, Fall Pippin.

**Union** —Northern Spy, Pearmain.

**Williams.**—Rambo, Pippin.

**Wyandot** —Rambo, Fall Pippin.

**Wood.**—Rambo, Gravenstein, Jersey Sweet, Hawley.

**Warren.**—Maiden Blush, Fall Pippin, Early Harvest, Summer Queen.

### BEST SIX VARIETIES OF WINTER APPLES.

**Athens.**—Roxberry Russet, Strawberry Russet, Romanite, Pearmain Pippins.

**Ashland.**—Northern Spy, Roxberry Russet, R. I. Greening, Tulpehocken, Milam, Spitzenberg, Newtown Pippin.

**Brown.**—Pryor's Red, Michael Henry Pippin, Roman Stem, Wine, Rome Beauty.

**Carroll.**—Winter Rambo, Waldower, R. I. Greening, Milam, Northern Spy.

**Columbiana** —Rambo, Tulpehocken, Waldower, Putnam's Russet.

**Grauga.**—Maiden Blush, Seek-no-further, Wine apples and Fall Pippins.

**Hancock.**—Yellow Bellflower, R. I. Greening, Baldwin, Lady Sweet, Red Seek-no-further.

**Huron.**—Baldwin, R. I. Greening, Red Canada, Seek-no-further, Peck's Pleasant.

**Jefferson.**—Russet, Northern Spy, Newtown Pippin, Baldwin, Waldower.

**Jackson.**—Wine Sap, Swaar, Pryor's Red, Talman Sweeting.

**Knox.**—Rambo, Spitzenberg, Bellflower, R. I. Greening, Rock Remain.

**Lucas.**—R. I. Greening, Baldwin, Spitzenberg, Bellflower.

**Lake** —R. I. Greening, Roxberry Russet, Baldwin, Northern Spy, Peck's Pleasant.

**Lawrence.**—Rome Beauty, Pryor's Red, Pearmain.

**Montgomery.**—Newtown Pippin, Jonathan, Bellflower, Smith Cider.

**Morrow**—Northern Spy, R. I. Greening, Rambo, English Russet, Talman Sweeting

**Medina.**—Greening, Nonesuch, Baldwin, Spitzenberg, Wine, Lady Washington.

**Noble.**—Spitzenberg, Rock Remain, Romanite, Russets.

**Richland.**—Rambo, Baldwin, Belmont, Spitzenberg, R. I. Greening.

**Summit.**—Spitzenberg, Nonesuch, Rambo, R. I. Greening, Baldwin, Pippins.

**Stark**—Rambo, Green and Yellow Pippins, R. I. Greening, Romanites.

**Trumbull.**—Spitzenberg, Wine Sap, Gates, Greening, Bellflower and Russet.

**Wyandot**—Bellflower, White Pippin, Wine Sap, R. I. Greening.

**Wood.**—R. I Greening, Northern Spy, Roxberry Russet, King of Tompkin's Co.

**Warren.**—White Pippin, Smith Cider, Rawle's Janet, Milam, Bellflower.

### VARIETIES MOST GENERALLY GROWN.

**Athens.**—Russets, Rambo, Bellflower and Pippins.

**Ashland**—Rambo, Tulpehocken, R. I. Greening, Milam, Roxberry Russet, Romanite, Seek-no-further, Pennocks and Pippins.

**Belmont.**—There are about 50 varieties grown here.

**Brown**—The varieties are almost endless.

**Butler**—Bellflower, Gold Russet, Smith Cider, Black Jacks.

**Carroll.**—Rambo, Spitzenberg, Gates, Greenings, Waldower, Russet and Pippin.

**Clermont.**—Jonathan, Bellflower, Pennock, Maiden Blush.

**Crawford.**—Rambo, R. I. Greening, Bellflower, Gates, and a general variety of grafted fruit.

**Defiance.**—There is a general variety—Greening, Spitzenberg, Bellflower, Canada Russet, English Russets and Northern Spy.

**Gallia.**—Rome Beauty and Russet.

**Columbiana.**—Nonpareil, Rambo, Gates, Tulpehocken, Romanite, Russet, Pippin, Sweet Bough.

**Geauga**—R I. Greening, Peck's Pleasant, Spitzenberg, Roxberry Russet.

**Hancock.**—Rambo, Yellow Bellflower, R. I. Greening, Baldwin, Gravenstein.

**Huron.**—Baldwin, R. I Greening, Red Canada, Rambo, Talman Sweeting, Yellow Bellflower, Newtown Pippins, Fall Pippins, Spitzenberg.

**Jefferson.**—Russet, Rambo, and most all varieties.

**Jackson.**—Bellflower, Golden and Putnam Russets, Pippins, Pearmain.

**Knox.**—Summer Queen, Hawesh Apple, Red Astrachan, Summer Sweeting.

**Logan.**—Most of all old kinds—little attention paid to nomenclature.

**Lucas.**—Greenings and Baldwins.

**Lake**—R. I. Greenings, Peck Pleasant, Roxberry Russet, Northern Spy, Maiden Blush, Spitzenberg, Seek-no-further.

**Licking.**—Russet, Greening, Pippins and Seek-no-further.

**Lawrence.**—Rome Beauty, and all other varieties to some extent.

**Montgomery.**—Bellflowers, Wine Sap, Romanites, Rambo and Pippins.

**Morrow.**—All of the varieties common through central Ohio.

**Medina.**—Rambo, Greening, Nonesuch and Spitzenberg.

**Noble.**—Rock Remain, Golden Russet, Baldwin, Rambo, Golden Pippin, Bellflower, Cooper, R. I. Greening.

**Putnam.**—Rambo and Bellflower.

**Portage.**—Common varieties—but little attention paid to nice varieties.

**Richland.**—Rambo, R. I. Greening, Gates, Pennocks.

**Summit.**—Greening, Red Astrachan, Pippin, Queen Ann, Spitzenberg.

**Stark.**—Rambo and Pippin.

**Seneca.**—There are a very large variety—Rambo, Yellow and White Bellflower, Pippins, Russets, Northern Spy, &c.

**Trumbull.**—Spitzenberg, Bellflower, Baldwin, Rambo, Gates, Higbee Sweet.

**Tuscarawas.**—Mostly grafted varieties.

**Union.**—Rambo, Bellflower, Tulpehocken, Seek no-further.

**Williams.**—R. I. Greening.

**Wyandot.**—Rambo, Bellflower and Fall Pippins.

**Wood.**—All of the more approved varieties.

**Wayne.**—Most of the improved varieties.

**Warren.**—White Pippins, Smith Cider, Milam, Wine Sap, Bellflower, Jersey Black, Newton, Maiden Blush, Fall Pippin.

## PEACHES.

"Does the peach crop generally succeed well in your county?

"What is the cause of failure of the peach crop?

"What varieties of peaches are generally grown?

"What three varieties of *free seed* peaches are considered best adapted to your county?

"What three varieties of clings are considered best adapted to your county?

"To what diseases are peach-trees or peaches most generally subject?"

The crop of this fruit is less certain in Ohio than formerly. In Clermont, Lake, Lucas, Putnam, Lorain, Summit, and a part of several other counties, it is partially successful. In nearly every county a greater or less number of trees are planted, with the hope that once or twice in four or five years they will produce fruit.

**The Causes of Failure.**—In the early settlement of the State, before the soil had become partially exhausted of its virgin richness, and when the greater proportion of wood-land than now protected the tree from injury during our coldest seasons, and when insects were less common, peaches were quite a sure crop, frequently the trees living twenty and thirty years. Now our winters kill thousands of them. In rich soil, peach-trees grow late in the fall, and do not harden their wood well; and in this condition they are most liable to injury. A tree in which the wood is well ripened will withstand very severe freezing without being killed. The newer and better varieties are more likely to suffer than the poorer sorts raised from pits. The only effectual safeguard against winter-killing is to plant the most hardy varieties, in dry, elevated situations, and in soil that will give a slow but healthy growth.

The peach-tree borer (*Ægeria exitiosa*, Say) is found throughout the State, and is a source of great injury to the young tree. Constant watchfulness is necessary to destroy it. The eggs are deposited near the root of the tree in early summer, where they hatch, and the young borer makes his way under the bark, devouring the inner bark and the sap-wood. Those who would save their trees from destruction by them, must wage an unrelenting warfare against the borer in all its stages of development. If they have entered the tree, they should be killed. Mr. Harris, in his work on "Insects Injurious to Vegetation," gives the following plan for preventing the female from depositing her eggs on the bark: "Remove the earth around the base of the tree, crush and destroy the cocoons and borers which may be found in it and under the bark, cover the wounded parts with the common clay composition, and surround the trunk with a strip of sheathing-paper eight or nine inches wide, which should extend two inches below the level of the soil, and be secured with strings of matting above. Fresh mortar should then be placed around the root, so as to confine the paper and prevent access beneath it, and the remaining cavity may be filled with new or unexhausted loam. This operation should be performed in the spring, or during the month of June. In winter the strings should be removed, and in the following spring the trees should be again examined for any borer that may have escaped search before, and the protecting application should be renewed."

All this should be done when the trees are first planted out, otherwise the borer will get the start, and perhaps materially injure the tree before the grower is aware of his presence.

In planting a peach orchard, great care should be taken in selecting soil free from stagnant water. This is very injurious to all cultivated plants, and especially so to the peach-tree, which is fastidious with respect to a "wet foot." One principal reason why sandy soil is better for them than any other is because it is naturally underdrained. Underdraining land intended for peach orchards will produce a more healthy growth of the tree, and render it more likely to withstand the attacks of both insects and disease.

## STRAWBERRIES.

"What varieties of strawberries are cultivated?
"Which succeed the best?"

This fruit succeeds well throughout the State. It is cultivated largely in the vicinity of Cleveland, Columbus, Dayton, and Cincinnati, and in sufficient quantities near all our smaller towns to supply the demand. There are few small villages where the owners of a lot do not grow sufficient for their own use. The increase in the amount of this fruit grown has been very great within the last five years. From both Cincinnati and Cleveland they are shipped in large quantities east, west, north, and south. Cleveland sends them to Cincinnati after those of the latter place are out of season.

While this fruit is cultivated largely near cities and towns, as yet only a small portion of the farmers in Ohio succeed in raising them. There are several reasons for this. Although it requires little care to grow them, yet if they do not receive that little at the right time they fail. Too often they are planted but not looked after afterward. Weeds overrun the bed, the ground becomes hard, and though the plants sometimes live, they do not produce much fruit; sometimes the soil is made so excessively rich, that, though there is a great growth of vine, no fruit is produced; and sometimes the reverse is the case, the soil being left hard, dry, and poor. For complete success, fine tilth is necessary; so is moisture. Rich vegetable mold, or woods earth, produces the best berries. Very often farmers choose plants that produce only male or female blossoms, and wonder why they do not bear. This mistake has been as frequently committed as any other; but now that hermaphrodite plants are being generally recommended, there will be less difficulty from this source.

THE YIELD PER ACRE.—The usual yield per acre, when cultivated for market, does not vary much from one hundred bushels. When grown in small beds, with the best cultivation, of course it greatly exceeds this.

COST OF CULTIVATION.—This is very much less than has been usually supposed. A grower of this fruit near Cleveland, who sometimes sells 2,000 bushels in a season, says the expense of cultivating them is not more than that of potatoes.

VARIETIES GROWN.—The kinds most commonly cultivated throughout the State are Wilson's Albany Seedling, Hovey's Seedling, Triomph de Gand, Washington, McAvoy's, Longworth's Prolific, and others.

## FARM CROPS.

"Are artichokes grown? If so, to what extent?

"Has Hungarian grass been grown in your county? What do farmers think of it?

"Is it still cultivated or abandoned?

"Is sorgho generally cultivated; and with what success?

"State any facts you may know in relation to the culture and production of the sorgho, and of the manufacture of syrup or sugar from it.

"Are oats regarded as a reliable crop? or do they deteriorate?

"To what diseases, if any, are oats most subject?

"What crop might profitably be substituted for the oat crop?

"What varieties of corn generally succeed best in your county?

"What is the usual time that corn requires to ripen, from the time of planting?

"Which varieties of corn succeed the best, those that are introduced from the North or South?

"Is tobacco successfully grown in your county? Is much of it grown?

"Is there more or less land cultivated, in consequence of the war, than formerly?

Artichokes—Artichokes are not much grown in the State. In some European countries they are planted in the woods for hogs to feed upon; but such experiments with them have not been made in this country. A few farmers have planted small patches for hogs, these animals digging them when the ground was not frozen; and so far the results have proved favorable to their culture for this purpose. The disturbance of the soil by the hogs mellows it for another crop, and a sufficient number of tubers are always left for future crops without replanting. This method of keeping swine is favorable to their healthy growth, and gives them an opportunity to exercise to a limited extent their natural instincts, which is of much importance.

Hungarian Grass.—This candidate for popular favor has been grown in all parts of the State with varying results. It is generally conceded that it requires a deep rich soil, and that it is an exhausting crop. As regards its value there was, for a few years, a difference of opinion, and this is yet the case to a limited extent, though a few continue to esteem it; its culture is being abandoned by a majority of farmers.

Sorgho.—The Chinese sugar-cane, which was introduced into this country a few years ago, has been very generally grown in every county in Ohio. The disposition of our people is such that they are led to try almost everything new that promises to be of value, when it can be done with little expense to themselves. It is vastly better that this should be so than that they should resist the introduction of new plants, animals and machinery, even though they do now and then take hold of what turns out to be a "humbug." Improvement in agriculture can only make rapid strides when the people are willing to try experiments, or adopt new practices which promise them greater success than they have previously had. Much was promised of the sorghum plant. Sugar and syrup which was made in Ohio from the maple only, and that in quantities sufficient to supply a small part only of the demand, was what every farmer would like to make for himself. He was promised this. As he could test the matter without incurring great loss, seed was planted throughout the State, and at first, in the rudest manner, the juice was expressed and evaporated, and though in this way no good syrup was made, yet the fact was demonstrated that the plant was rich in saccharine matter, requiring appropriate manipulation only to convert it into an article of superior value. To secure this, crushers, to separate the juice, and evaporators to reduce it to syrup, have been invented, and many experiments have been made, and though the results yet reached are not everything that can be desired, they are so satisfactory that there is not the least doubt that the plant is a valuable acquisition. In 1861, millions of gallons of syrup were made, some of which was of a very superior character, nearly equal in flavor and value to golden syrup, and the present year (1862) the quantity of ground planted is larger than ever before. As yet but little sugar has been made; but, at the Sugar-cane Growers' Convention, held in Columbus, in January, 1862, many samples of so-called sorgho sugar, in quantities of from ten to fifty pounds, were exhibited, a number of which were as good as New Orleans sugar, and growers are sanguine that what has been made in small quantities by a few, will yet be made in large quantities by many. While sorgho may be considered a success, it may be added, that it succeeds best in the southern half of the State, and here is where it is grown to the greatest extent. In some of the northern counties considerable is grown, but unless the soil is warm and naturally underdrained, so as to hasten its ripening, the climate is too cold for its perfect maturity. There is no doubt, however, that when underdraining is generally practiced in the State, as it certainly will be, cane can be grown with success much further north than it now is.

Oats.—This crop is generally considered a reliable one in Ohio. It is necessary that they be sown as early in the season as March and April for the best results. Late sown oats do not ripen well; the grain is light, and they are more subject to rust. They succeed in a soil heavier and wetter than does wheat or corn. The quantity of seed used per acre in the State is usually two and a half bushels. A thin, dry or loose soil never produces a good crop without manuring, and unless it be deep and rich they are severely affected by drought. Very wet seasons produce a great growth of straw, render them extremely liable to lodge, rust, and produce a poorly filled head. Except in wet seasons, they are affected by no disease. Oat straw, well cured, especially if cut green, is more valuable for stock than that of any other grain, and is always carefully saved by nearly all farmers. For the horse, no grain grown in Ohio could be substituted to advantage. For young stock, especially for lambs, colts and calves, they are better than corn. Not that these animals fat more readily on them, but it produces a better development of muscle. Oats contain much more of the muscle-producing element than corn, and in young animals not designed to be slaughtered, the development of muscle is of more importance than fatty matter.

For animals that are required to labor, there has been a difference of opinion, whether corn or oats was best, but the opinions of most farmers are in favor of the latter. This accords with what might be expected from a chemical analysis of the two grains. If we wish to use the muscular system of an animal, we must feed that animal on food rich in substances that produce it; if we wish to fat an animal, corn contains great abundance of material for its production, and is universally acknowledged to be the superior grain. It has been suggested by some that barley or rye might be substituted for oats, but neither could be raised in so great abundance by the same labor, and rye would be too heavy a food unless mixed with less nutritious grain. There is one complaint against oats as food for horses, viz: that it too often passes through the digestive system of the animal undigested. This difficulty is easily overcome by grinding the grain, and the gain by this would be more than sufficient to pay the expense. The thick outer covering of the oat is not sufficiently broken by mastication to enable the gastric juice to come in complete contact with its nutritious portion, and it is for this reason that so much of its value is lost. A mixture of about half oats with equal quantities of corn and rye has been found by experience to produce the best feed for the horse. The quantity of corn may be increased in cold and diminished in warm weather, with profit. Such a mixture, ground together and fed on finely cut straw, is in very common use throughout the State.

**Corn.**—The corn cultivated in Ohio is most commonly known under the names of Gourd-seed and Dent. Of these there are many varieties, some of which have doubtless arisen from the change in climate and soil to which this grain is so commonly subjected. The yellow dent gourd-seed with red cob is more generally cultivated than any other. The white is grown to some extent in southern Ohio, but requiring a longer season to ripen, is not much cultivated in the north part of the State; but in many counties in this section, in soil where early planting is impracticable, flint corn is sometimes planted, and so is an early variety of gourd-seed, known among farmers as "sheep tooth" or "hackberry" corn.

**Time to ripen.**—The time required to ripen corn depends something on the soil and variety planted Four and a half months may be considered the average.

**Varieties from North or South.**—The practice of changing the seed for that grown in other soils and other localities, is very common. Corn is supposed to deteriorate if planted on the same farm more than three seasons. Unless good soil and thorough culture is given, this is doubtless true; with these corn does not deteriorate, even though the same varieties be planted for many years in succession. There are many instances in all parts of Ohio where farmers have not changed their seed corn for thirty years, and the crops they raise attest that there has been no deterioration. The reason why a change of seed produces such favorable results is, that farmers either get an improved variety, or, if the same variety, that which has had a more perfect growth. A farmer raises a poor crop of corn; if he plants seed from this, its imperfect development produces deterioration in the succeeding crop; but he goes to his neighbor, who has seed grown from rich soil and under the influence of good cultivation, and from this, even without the best of care, he gets fair returns. Corn will deteriorate in any soil not adapted to its growth, and for this reason it is not well grown; corn will improve in any soil fitted for it either by nature or culture, if the best ears are selected and planted, though the seed is never changed. Seed from either north or south of the place where it is to be planted is less likely to produce a good crop than that chosen from the immediate vicinity, or from the same latitude. If brought from the south, the season will not be long enough for it to ripen well, and in a few years it will deteriorate and adapt itself to the change of climate; if from the north, it will mature early, and although this may be an advantage in short seasons, yet up to a certain period, the longer corn can grow the better the crop will be.

For the improvement of our corn the same course adopted by Mr. F. F. Hallett, of Brighton, England, for the improvement of wheat, could be pursued with similar results. The details of Mr. Hallett's experiments are thus given in the Journal of the Royal Agricultural Society: "A grain produces a 'stool,' consisting of many ears. I plant the grain from these ears in such a manner that each ear occupies a row by itself, each of its grains occupying a hole in this row; the holes being 12 inches apart every way. At harvest, after the most careful study and comparison of the stools from all these grains, I select the finest *one* which I accept as a proof that its parent grain was the best of all under the peculiar circumstances of that season. This process is repeated annually, starting every year with the *proved* best grain, although the verification of this superiority is not obtained until the following harvest. During these investigations no single circumstance has struck me so forcibly illustrating the necessity for repeated selections, than the fact, that of the grains in the same ear, *one is found to excel all others in vital power.*"

This plan was followed for four years, without manuring or any system of forcing, with the following remarkable results: In 1857 he selected his first head of wheat, which was four and three-fourths inches long, and contained 47 grains. In 1858, at harvest, he found the finest head was six and one-fourth inches long, and contained 79 grains, with ten heads on the finest stool. The grain from the best head was planted, and the best stool had *twenty-two* stalks, with one head seven and three-fourths inches long, containing 91 kernels. These were planted, but the season being the wet one of 1860, only two heads ripened, but these were on a stool of *thirty-nine* stalks, and the best head contained 74 grains. One of these produced a stool with *fifty-two* stalks, the best head of which was eight and three-fourths inches long, and contained 123 kernels. Thus in four years the length of the head was doubled, and the number of kernels increased from 47 to 123, and the number of stalks from one grain from 10 to 52. In the fall of 1860, Mr. Hallett had sufficient seed of his "pedigree wheat" to sow 10 acres, with one peck to the acre, and although he says it was the "worst wheat field on his farm," yet the yield was 57 bushels per acre.

In improving corn the same general principles are applicable, varying the experiments only to adapt them to the nature of the plant.

EFFECT OF WAR ON AMOUNT OF LAND CULTIVATED.—As yet the war has made no perceptible difference in the amount of land cultivated in Ohio. It would seem at first thought that if we have 130,000 men in the field, drawn from every department of industry, it would seriously affect the farming interest. The war has not yet drawn largely upon this class of our population. Comparatively few of the owners and tillers of the soil have enlisted for the war. Settled in life, with cares and responsibilities that bind him to his home and the soil, he does not loose his hold on the first "tap of the drum." True, he is every inch a patriot, and would give his last drop of blood before he would see his country in ruins; yet from the very nature of the case, men's occupations and relations in life determine who shall be first and last on the tented field. True, thousands of farm hands have joined the army; but such have not usually been farmers. That these have been missed is also true, but the agriculturist, when he cannot hire, with his own muscle, with the aid he gets from increased machinery, and with that greatest of all labor-saving instruments, the brain, he does all the work he would have done had help been abundant. Not so many houses are built, not so many farm improvements are made, not so many days of leisure are taken; but just as much and in some instances more land has been planted and sown since the war than previously. Agriculture must go on in order that the war may be prosecuted; though one of the "arts of peace," it is as much a supporter of the contests between belligerents as the manufacture of arms, ammunition, and army blankets. Though we may look for a decline of those pursuits which minister to the elegancies of life; though many luxuries and articles not at all necessary to our health and comfort will be dispensed with, yet unless this war continues much longer than with the present number of men and vigor with which it is being prosecuted, it seems possible, the number of acres under cultivation will not be decreased.

## MACHINERY.

"Is there a disposition among farmers generally to employ more machinery than formerly?

"Are reapers and mowers in general use in your county?

"What reaper is considered the best? "What mower is considered the best?

"Are horse-rakes in general use?

"Are grain-drills in general use?

"Are any hay-pitching machines used?

"Are any double plows used; and to what extent?

"Is subsoiling practiced in your county?

"Do farmers plow deeper than formerly?"

Machinery used by Farmers.—The advantage gained by using machinery is, with it a power which would otherwise go to waste is utilized. The amount of this power, treasured up in wind, water, electricity, and in the muscular system of animals, is almost infinite; and it is the greatest triumph of human genius, when, by the arrangement of wheel and axle, lever and pulley, it applies it to its own use. The stream of water, that goes rushing on to the lake or ocean, never grumbles when we ask it to just give a little turn to our water-wheel when it passes; the wind is ever going our way, and will just as readily carry a freighted ship to Africa, China, Japan or London, as to go empty; electricity never grumbles when we ask it to do an errand for us in New York or Boston—"it is going there every minute," and had "just as soon do it as not." Some writers seem to think that it is the nature of man to own slaves, but it is only a perversion of this nature when he claims human ones; his true slaves are the forces of nature, which are ever ready to work at his bidding. They only ask to be harnessed, after which they will "work for nothing and board themselves." Machinery gives us the long end of the lever, and, by little more than the touch of our finger, do what, with our hands alone, we could never accomplish. The progress of the human race, in a great measure, depends upon the substitution of machinery for human muscle. It emancipates the man, and gives him leisure for culture in the pursuit of science and art, or for the extension of his enterprise. The use of machinery has done much to ennoble the pursuit of agriculture. The excessive toil to which the farmer is subject without it is degrading. Labor is ennobling, and man is all the better that he cannot pluck and eat his daily food, and surround himself with elegancies, without working for them; but when that labor is excessive it makes him a slave. Its effects upon the body, though not as disastrous to health as a sedentary life, where one is ever breathing a polluted atmosphere, and affording so little exercise that the body becomes dwarfed, and unfitted to perform properly its functions, are such as to give stiffness and awkwardness, and destroy all gracefulness of movement and nobility of appearance. Like a wheel that has been battered out of its proper shape, the slave to toil moves irregularly. Its effect upon the mind is worse than upon the body. Excessive labor consumes upon the muscles that nervous energy intended for use on both muscle and brain ; and the latter, like a wheel with little water to turn it, goes with uncertain force. If we would have the brain act with power we must save a portion of our strength to expend upon it. The application of thought to agriculture makes it an entirely different pursuit from what it is without it. Thought, which is but another word for the application of science to the culture of the soil, ennobles it. From being a pursuit which exhausts it in a vain endeavor to extort a meagre subsistence from it; from being a pursuit in which man only vegetates, and hardly makes his income for the year cover his expenses, it becomes the noblest business in which man can engage. A celebrated painter was once asked by a young student "with what he mixed his paints to produce such fine results?" "With *brains*, sir," was the reply. The answer, though it gave no light on the details of the art to the young man, was full of truth. So with agriculture. If we would make it what it is capable of becoming, we must use brains in the preparation of our soil. The use of machinery on the farm, the substitution of brute labor for human labor, enables the farmer to do this. With it he can perform the same work to-day, with one hand, that without it required four. These three hands can engage in other pursuits—join the army, or, if sons of the farmer, are released from toil, and can now attend college and obtain an education.

Mowers and Reapers.—The increased use of machinery on the farm in Ohio, within the last ten years, has been immense. The mowing and reaping machine has saved many harvests which, owing to the demand for men in other directions, could never have been secured without them. They are now in general use in almost every township and on almost every farm in Ohio. The saving they effect in the number of men employed depends upon the preparation of the surface of the ground for their use, the efficiency with which they are worked, and the perfection of the machine. As yet farmers have not taken much pains to remove stones, stumps and level inequalities in their meadows and grain-fields, for the better working of machinery. The efforts have rather been on the part of inventors to produce implements that would work almost anywhere—and their success has been complete. The improvement in the style of mowers and reapers within the last five years has been very great. Combinations of the improvements made by different inventors have been made—till now there is little more to ask. The greatest improvement have been in the saving of power required to work them. Now, a light team, going at a slow pace, will do, with the machines of present manufacture, what five years ago would require a heavy team, going at a rapid rate. The simplicity of their structure, their strength, and ease with which they are handled, are now much greater than ever before. Most of the machinery for cutting grass and grain, used in Ohio, is manufactured in the State. The nearer home farmers can procure a good machine, the more likely they are to own one.

As to which is the best mower or reaper there is of course diversity of opinion, and it would require nicer tests than have been given them at any trial to decide this question satisfactorily.

HORSE RAKES —Very few farmers who have grass to cut try to get along without a horse rake. Their use commenced before the introduction of mowing machines, and now, in all the grass-growing regions of the State, little hay is raked by hand.

PITCHING MACHINES.—Machines for pitching hay are not yet in general use, though they are rapidly being introduced in many places.

ROPING HAY.—This method of drawing hay to the barn or stack, when situated in the meadow, is common in some districts and is not known in others. The rapidity with which a winrow can be drawn to the stack without pitching a pound of it is very great.

With the aid of the mower and reaper, the horse rake, the pitching machine and rope, farmers now secure their crops with less than half the number of hands it formerly required. It is doubtful if in any department of labor has there been as great improvement, in so short a time, as has been effected for the farmer by these implements.

On their comparative value an intelligent farmer (Mr. D. Atwater) of Mantua, Portage county, writes as follows: "For several years I have cut most of my grass with a mowing machine; have raked it with a horse-rake; have drawn it to the barn or stack with a repe; and, for the last two years, have pitched it with a horse-fork. I have found all of these improvements to work *well together*, and that, by working much less myself than formerly, I could make more than twice the progress with half the help, and do it equally well. I have found them a great saving when means to hire were not abundant. Though I count all of these valuable, if I were to class them according to their real value in labor-saving, I would say first the horse-rake; second, the rope; third, the mower; and fourth, the horse-fork. I place the rope before the mower because five dollars will pay the expense of one for ten years, and often the use of one two hours will save more than that amount.

CULTIVATORS AND HORSE-HOES.—In cultivating Indian corn and potatoes, there has been great improvement within a few years. Formerly, a shovel-plow, of poor quality, was the only horse tool used in the cornfield; what it did not do, must be done by the hoe or left undone. Now, the shovel-plow has been greatly improved, and the cultivator has been almost universally introduced. This and the plow are found to work well together. By their thorough use little is left to be done by hand In addition to these, the horse-hoe is being introduced, and in soils free from stones and other impediments to its use it is found to work advantageously, both in destroying weeds and in mellowing the soil. It does the work better than can be done with the hoe, and the saving in both time and labor is very great. A boy, with a good horse or mule with the improved tools for working among corn, potatoes, and other crops grown in rows, can keep fifty acres in a well cultivated condition. The cultivator and the hoe give level culture, which is being more generally adopted than hilling, especially for corn.

ROLLERS AND CLOD-CRUSHERS.—The clod-crusher has not yet been very generally introduced into the State. A few have tried and found it to work well for the purpose of reducing soil to a fine state. It can never be used when it is wet, without injury. Rollers are considerably used before sowing to reduce lumps; after the plant has come up, to fix the roots more firmly, and on light soils, to consolidate them. It is also much used to improve the surface of meadows. It requires a good deal of care to be able to use the roller and clod crusher at the right time, otherwise more harm than good will result. With proper precaution, they are valuable implements, and should have a more extensive use. On light soils wheat is not likely to succeed without the use of the roller to press it together on the surface, and give it more firmness, and for this purpose its use on such soils produces excellent results.

GRAIN-DRILLS.—Grain-drills are in general use throughout the wheat-growing region of the State. Though they may not have fulfilled the claim set up for them when first introduced—"that their use would add several bushels per acre to the yield of grain"—yet, where it is extensively grown, their use is the most economical method of sowing it. No amount of machinery for sowing grain will greatly increase the yield, unless, at the same time, the soil be better fitted for the crop. One advantage in the use of the drill is, that it requires the soil to be better prepared for its use, than when the grain is sown broadcast. That it deposits the seed more evenly, with less labor, and in a better position to root well, is now generally admitted.

PLOWING.—Improvement in plowing is the basis of all improved culture of the soil. Without it, other improvements are of little importance. Plows have been very greatly improved within a few years, and adapted to almost every kind of soil or variety of work; so that now there is no reason why we should not have perfection in the art.

The object of plowing is two-fold: the pulverization and loosening of the soil that it may be easily penetrated by the roots of plants, and be rendered permeable to both moisture and the atmosphere, and the covering of weeds, grass, stubble or manure. Providing the soil contains abundance of plant food, we cannot give the roots too much room to penetrate it. Where it is hard, the rootlets come in contact with only a small portion of soil, find little food, and make a feeble growth. Any one who will take the trouble to examine the ramifications of the roots of a hill of corn planted in a well-plowed field, and compare it with one from a hard, impenetrable soil, will at once see the benefit of pulverization.

REQUISITES TO GOOD PLOWING.—The first is a good plow, of the right shape, sharp, bright, and adapted to the variety of plowing intended. Where the main object is to loosen the soil, it should take a narrow furrow; where it is to turn under grass or turf, it is better that it should cut a wide slice. Plows made to cut narrow can never be made to turn a wide furrow well; but a wide-working plow can be made to work narrow without difficulty. It is better that it turn a furrow that shall lap on the previous one. The point where the beam joins the mould-board should be somewhat higher from the ground than plows are usually made, in order to prevent clogging. A wheel should be attached, which can easily be removed; and the points should be of the best quality.

Next to a good plow, is required a good team. The greatest fault with our plow teams is, they are not strong enough. To plow well, it is important that we plow deep, and to do this strength is required. If the horses in Ohio were twenty-five per cent. stronger, our plowing would be improved in proportion. We usually adapt the depth of our plowing to the strength of the team. It is also important that they be well trained. If half the attention of the driver is occupied in guiding his horses, he will plow very imperfectly. We do not give sufficient attention to the training of horses for this purpose. They ought to be so under the control of the plowman, that his word is sufficient to produce a change in any movement he desired. A plow horse should not be a tall, thin animal, but low and broad both in the chest and on the back. The less unnecessary gearing attached to the animal while at work the better.

With a good team and a good plow we are, however, only *prepared* to do good work; it requires a master hand to do the guiding. In England the plowman does little else, and learns his trade so perfectly that every furrow is turned with the greatest precision; very little difference exists in their depth, or the evenness with which they are turned, and a line could scarcely be drawn with less variation from right to left.

One reason why our farmers plow so imperfectly is, they undertake to do too much. One acre, or at most one and a quarter, is as much as a single team can do well in a single day; and yet most plowmen pretend that two acres is only a good day's work. So much cannot be done well. True, it may not be so important that the same perfection be reached as by the English plowman, yet it is necessary that all the soil be turned and as completely pulverized as possible. Upon the perfection with which the soil is tilled, in a great measure, depends our crop. In "striking out a land," it will add to the ease with which the work is well done if great accuracy be observed, so that throughout its whole length it be of the same width. Wherever there is variation will be found imperfection; the plow cuts too wide here and too narrow there; leaves some unturned, and some turned a second time.

RIDGING OR LAP-PLOWING.—In soil too hard and stiff, by its preponderance of clay, there is great advantage gained by ridging the land in the fall, that is, by turning two furrows on to an unplowed surface, so that their edges shall touch each other, thus leaving the land in alternate furrows and ridges. The frosts of winter have a very important influence in ameliorating such soils and reducing them to a well pulverized condition. This practice might be more extensively followed by many of our farmers with great profit.

**Deep Plowing.**—The practice of plowing deep is gaining ground throughout the State. Many farmers disturb the soil three or four inches below what was practiced a few years ago. The benefits of this course need not be enumerated here. Still deeper plowing will be practiced when farmers thoroughly underdrain their land, and save and make all the manure they can advantageously use. Where deepening the soil turns up a crude earth unfit for nourishing plants, it had better not be practiced, unless at the same time means are taken to improve its character by manuring. The average depth to which the soil is plowed by most of our farmers is from five to nine inches.

**Subsoiling.**—The practice of subsoil plowing is not common in this State. While this is the case, the advantages said to come from its practice have induced many to plow deeper than before; and it is mainly from a disposition to believe in the advantages of subsoiling, that we are indebted for the deeper plowing most farmers give their soil than formerly.

**Plowing Matches.**—These are less frequently held than formerly. Much good might result from a plowing match held in every township once a year. This would be preferable to having it in connection with county agricultural societies, when few people are likely to participate either in the plowing or as lookers-on. If held in every township under strict rules, farmers and their sons could give exclusive attention to it, and so great would be the interest they could not fail to be largely attended. It would be best to hold them under the auspices of a Farmer's Club, and, for the benefit of all who participated, a circular, defining what is considered good plowing, its object and the means by which it is best accomplished, should be furnished to each competitor. Men can never work above their ideal; if this be low, their work is poorly done; if high, though they may not attain, they will come near it. To institute a plowing match where the ideal is poor plowing, will give little pleasure or profit. It is not necessary that the number of plowmen should be large; men who do not contest, will gain much information about good plowing, and how to do it, by seeing others work.

## FARM IMPROVEMENTS.

"Is liming practiced to any extent; and with what result?

"Has any system been adopted for preserving stable manures?

"Has underdraining been practiced to any considerable extent; and with what result?

"Are clod-crushers or rollers used? "Are cultivators in general use?

"Has the steam threshing machine been introduced into your county?

"Are portable engines in use on farms?"

**Underdraining.**—The most important improvement in agriculture in the present age is underdraining. The farmer has more to fear from stagnant water in his soil than from too much or too little rain. It has more to do with the non-success of agriculture than is usually supposed. By stagnant water is meant standing water, that which does not flow, is not agitated; quiet, still, or sluggish.

The purest water, when left in this state long, becomes impure, unwholesome. Stagnant water may exist in bodies, as lakes, ponds, rivers, marshes and hollows, or it may exist in the soil. In the former condition, the chief injury arises from the unhealthy atmosphere it produces—from its being unsightly to the eye, and in its injuring animals and men who drink it. Its stagnation in the soil is what the farmer has most to fear. A certain class of plants luxuriate in stagnant water, taking up the impurities it contains, which would otherwise contaminate the air, and converting them into their own structure. Such plants, however, have little agricultural value. Stagnant water is poisonous to most useful plants cultivated by the farmer. They will not grow in it. When water becomes stagnant in meadows and fields of grain, the flow of sap is interfered with; it becomes loaded with crude matter unfit to nourish it, and, to use a common expression, "drowns out" in proportion to the degree of stagnation of water in the soil.

A tree or plant is very different from an animal. It does not go from place to place for its food. The roots permeate the soil, and, to a certain extent, travel, partly to find food but also to give surface through which that food may be brought to them. Now stagnant water does two things: it presents to the roots matter which will not nourish but poison, and at the same time cuts off the supply of water which would bring plant food. Food is taken in solutions. The water changes its position in the soil, passing in contact with the roots gives up to them whatever matter it contains fit for their growth, passes on and fresh water takes its place. The water stagnates; no fresh food is brought to the plant, and its growth is at once checked. There is much of our land in which water is almost constantly in this condition, and in which plants do not grow well, though it may be rich in plant food, as in low places, on the borders of streams, and where the surface is so level that water does not readily make its way to the streams. Much of our tillable soil contains stagnant water during that portion of the year when rain is abundant and long continued. A corn or wheat field, where this state exists, shews signs of sickness, and the crop never comes to a full development. Hundreds of the corn and wheat fields of Ohio contain portions of soil in which this condition exists. There is little doubt that the agriculture of the State is diminished fifty per cent. by it. A remedy is, however, found in underdraining. How this relieves the soil is best illustrated by comparing it to earth in a pot when water is frequently applied in quantities so large that the means for its escape are not sufficient. Make a hole in the bottom of the pot, and this surplus water passes through the soil leaving whatever matter in solution it may contain for any plant that may be growing in it. Now underdraining taps the soil to the depth of three or four feet, lets out the surplus or standing water it contains, relieves the drowning roots, and gives an opportunity for them to receive fresh supplies of food from the changing fluids which constantly pass them.

Another advantage we should gain from underdraining would be the prevention of drouths. In the dryest season the air is always charged with large quantities of moisture which needs only the right conditions to deposit it in showers upon the earth. When a pitcher filled with ice water stands for a few moments on our table on the hottest and dryest day, it becomes covered with moisture. Being cold it cools the stratum of air in contact with it, renders its ability to hold its moisture much less, and the surplus is deposited like dew on the pitcher When we underdrain our land we relieve it of the surplus water and air takes its place. In this condition we can plow it deeper, cultivate it more thoroughly, and allow the air to circulate freely in it during drouth. The air, which contains much moisture, coming in contact with the cooler soil, is chilled, loses its power to hold water, and gives it up to the soil. The effect of drouth is prevented by underdraining, and the subsoiling and improved culture which is sure to follow.

Although underdraining has not yet been carried to great extent in Ohio, farmers are giving more and more attention to the subject every year. All who have adopted it report most satisfactory results. In a few years thousands of acres will be improved by this means, which now produce but meagre returns. The number of useless acres will be very greatly reduced by underdraining, and farms will be enlarged without adding to their number of acres.

**Liming Land.**—The practice of liming land in this State is not very extensively practiced. There are good reasons for this. Lime is high, and farmers cannot afford to buy it; and though in some instances its use has proved beneficial, yet in many others no appreciable results have followed. Very much of the soil of Ohio contains large quantities of this material, and it is doubted if, except in those instances where it is needed in large quantities to correct some acidity, or where there is known to be exhaustion of this material, it will pay to use it in large quantities. The amount of lime needed to supply the living plant is not large, and its frequent application in small quantities produces better results than large amounts after long intervals. By improving the physical condition of the soil by means of underdraining, subsoiling and good culture, the use of gypsum, with all the manure that can be made on the farm, little lime, except in special instances, will be needed in Ohio for many years.

**Manure, and how it is saved.**—No system for saving manure so that none of its virtues shall be wasted has come into general use. In Lake and Geauga counties more pains is taken with it than in any part of Ohio, and there are some barns so constructed that the manure is saved in cellars; a few use sheds to prevent its leaching; occasional instances of similar practices exist in other counties, but the common practice with farmers throughout the State is to throw the stable manure through windows and doors into piles under the eaves, where it is exposed to rain and sunshine, and deteriorated in quality as well as greatly diminished in quantity. This practice might very properly be denominated the "leaching system" or the "no system," for it is really no system; such a course being the cheapest possible to get it out of the way. In spring it is hauled to fields and spread, or, perhaps, it is allowed to remain a year in this condition, by which time it is well rotted and much of it dissipated and lost to the farmer. The droppings of cattle, sheep, horses, etc., that run out, is never looked after further than to spread them so that its effects shall be somewhat evenly distributed. It is safe to say that half of the manure made in the State finds its way into the atmosphere, where it is out of the farmers reach, and as likely to go to feed weeds as useful plants, and be brought down by rains where it can be of no use, or into the streams where it finds its way to the ocean to be deposited in strata and locked up for whole geological ages. Every shower that falls carries to the streams fertilizing material. Creeks are always loaded with it, and could they be spread upon the soil would render it exceedingly fertile. In those districts where the land is so rich that a long series of years of cropping does not exhaust it, it may not be so important that farmers make and save all the manure possible; such localities, though they are found in our fertile valleys, constitute a small portion of our tillable land. Now that the natural richness of many of our farms is largely consumed, it becomes a matter of importance that their fertility restored be kept up by the application of fertilizers, and the art of making and applying them becomes as valuable as the art of tilling. No farmer can afford to cultivate the soil, year after year, for half a crop, yet unless that soil be fertile he cannot obtain more. Farm crops have but a few months to complete their growth; and unless we surround them with circumstances which favor it, that growth is never as great as the capacity of the plant will allow. Besides having the soil in a good mechanical condition, it must contain the elements from which plants are made. Except what exists in the soil, and what is furnished from the atmosphere, manure is the source of these elements. No farmer would think of building a house without nails, or glass, or lumber; if he did, the building would be a very imperfect structure; yet he too often expects plants will be built with scanty material, and is disappointed when they mature with a growth as scanty as was the material from which they drew their supplies. If farmers would be completely successful in their pursuit, they must not forget that every source of manure that exists on the farm should be attended to with care.

The sources of manure which exist on most of our farms are more extensive than many farmers believe. A careful survey of them would reveal many not at all suspected. As a geological survey of the country reveals much hidden mineral wealth, so does a survey for the sources from which manure may be made bring to light much material for plant food. Let us look at them.

Barn-Yard Manure—This is the most important source of manure on the farm. Its value depends on the care with which it is saved, and the richness of the food given the animal making it. That from animals fed entirely on hay or straw is not near as valuable as when grain is given. That from the horse and sheep is most valuable, that from the cow next. The liquid portion is more valuable than the solid. In saving stable manure, abundance of absorbing material should be provided to take up these liquids and hold them. Straw, cut fine, answers a very good purpose; so do leaves, spent tan, and sawdust. These droppings should be taken from the stable and wheeled to the compost-heap daily. If thrown under the eaves, or at the door, much is washed away and lost by the droppings from the roof. A compost-heap need not be under cover. The amount of rain that naturally falls upon it will not be more than is sufficient to prevent fire-fanging or burning. The compost-heap should be situated in some convenient position, and alternate layers of muck may be used in its formation. Half muck and half barn-yard manure, after being composted one year, makes an excellent dressing for soils. When cellars are used, to which the manure is passed from the stable, great care should be taken to prevent the escape of any gases which arise from decomposition, as these, passing to the stable above, render the atmosphere impure and injure the animals; they also penetrate the hay, and injure its quality. These gases furnish important elements of fertility, and if they escape into the air, are lost. Where sheep are wintered in sheds, the droppings of each day should be liberally covered with straw or dry leaves. This prevents any injury to the health of the sheep from impure air or filth, and saves the necessity of removing the manure to the compost-heap. Sheep manure is exceedingly valuable; but when these animals are wintered in the open air, much of this value is lost. If they are housed, the most scrupulous cleanliness is necessary to prevent disease. Great care in saving manure about stables and sheds always renders the atmosphere pure in those places.

Hog Manure.—This possesses a high degree of value, partly from the fact that the animal is fed largely on rich food. Little account is ever made of it by farmers. A hog-pen is rarely kept clean, and the atmosphere about it is always highly charged with emanations, rendering it more of a nuisance than a place of comfort for the animal. The manure from a single grown hog, if carefully saved, will furnish the fertilizers to grow sufficient corn for fattening him. The hog-pen should be so constructed that it may be easily cleaned, and should be so well supplied with litter that all those portions of the excrement which are volatile will be saved from evaporation. One of the best materials to use about the sty is charcoal. Rotten wood, if dry and pounded fine, is almost equally good. The braze which is taken from engines on the railroad, at the stations, is a very excellent material to spread over the sty-floor, to retain moisture and gases. The farmer may know that manure is being wasted about his sty whenever any disagreeable odors arise from, or when rank weeds grow around it.

Hen Manure.—This possesses a value almost equal to guano. Rarely is it saved. If the floor of the hen-roost be covered with a few inches of fine vegetable mold occasionally, it will retain that portion which would otherwise be lost, and keep it so clean that poultry vermin will not gain a lodgment in it.

The Privy.—If properly saved, no manure is more valuable than night soil. If for no other purpose than to preserve the health of those who frequent it, the privy should be kept sweet and clean. Nothing is so good for this purpose as fresh charcoal applied weekly. It absorbs and retains all the volatile matter that forms in it. Next to this comes woods earth or vegetable mold. Still other material can be used with good results. If the stable, the sty, and the privy, which from necessity are always near the house, were always kept scrupulously neat and clean by those means necessary to prevent a waste of manure, they would not be what commonly they are—nuisances and "eye-sores" to persons of taste or refined sensibilities.

Other Sources.—We have incidentally referred to other sources of manure than the stable. A glance at them will indicate to the farmer what they are.

Muck.—The most important of these is muck, found in low places, marshes, swamps, or on the edges of streams. It is composed largely of decayed vegetable matter, as grass, sticks, leaves, and the deposit of matter brought from the high land by rains, and which has accumulated for centuries. In its crude state, it is too acid, only partly decomposed, and unfit for application to the soil. It needs exposure to air, rain, cold, and admixture with other substances. It may be hauled from its bed in summer or fall, when it is quite dry, and deposited in small heaps, where, by the action of frost in winter, it is reduced to a fine state. It is much better, however, if composted with stable manure, deodorizing it, absorbing its urine, and dividing it. The action of the manure upon the muck hastens its decomposition and preparation for use. Before composting, it is greatly improved by being left in heaps for a year, mixed with lime, ashes, or salts, and allowed to freeze and thaw.

Leaves.—The woods contain large quantities of leaves, which may be made into valuable manure. They should be used mostly as bedding for stock, and thus incorporated with animal matter. They contain a large percentage of mineral matter of a kind exceedingly valuable to plants.

Spent Tan.—Where this can be had in a well-rotted condition, it is very useful as a divider of animal manures, is an excellent absorbent, and improves the physical character of heavy soils. Where it does not need to be hauled a great distance, it will pay to use it.

Turf.—Turf is full of the roots of grass, and, when decomposed, furnishes a considerable amount of plant food, and may be treated as spent tan.

River Mud.—This is often full of organic and mineral matter that has been deposited from water which has passed over fertile soil. Whenever it exists in convenient positions for obtaining, it may be taken from its bed and allowed to freeze and thaw for one winter, when it is fit for use. It should be carefully examined before hauling, to ascertain its value.

Ashes.—The ashes which collect about the farm-house usually do the farmer little good. They possess a high value for meadow, and, when mixed with muck or similar material, improve it greatly. They should always be saved.

Soap Suds.—Although the quantity of this excellent liquid manure that collects about a house is not large, yet in the course of a life-time it would be sufficient to produce a large amount of vegetable growth if applied to grass; or, as would be more convenient, to the trees that grow about the house, where it produces the best effects. It may also be thrown on the compost heap and improve its character. The common practice of allowing this liquid to go out at the back door, or into open drains, is slovenly, and ought not to be followed. The rank weeds and foul odors that arise from it are unpleasant to both eye and olfactory nerve.

**Weeds.**—If the farmer allows weeds to grow, before they mature their seeds they should be thrown on the compost heap. Every farmer should form one of these heaps, and throughout the year add to it from every possible source.

**Bones.**—The bones that collect about the farm should all be saved and used for manuring the garden. Though their number is small, their value is great. Without bone manure, the yield of wheat in England would be reduced one-fourth. Though they are much the best when treated with acid, so as to make a superphosphate, yet the few found on the farm may be burned, dissolved in strong lye, or softened by composting in horse manure when this is in a heating condition. They should be applied *in* rather than *on* the soil.

**Dead Animals.**—These should never be allowed to decay, poisoning the air, but be covered with earth so as to prevent the escape of the gasses that become liberated by decomposition. In this way they will in time become valuable.

In addition to the sources named there are many others which every farmer will note for himself and appropriate to his use. If farmers felt the necessity for manure which exists, in order to make farming more profitable, they would ever be on the look out for it, and much that now goes to waste would be saved.

While arguing the importance of manure, it should be remembered that it will not supply the place of thorough culture. The latter, even without it, produces astonishing results. Rev. J. Smith, author of the Lois Weedon system of wheat culture, proves this, when he raises wheat fourteen years in succession on inferior soil without manure, and has an average yield of 35 bushels. It is sown in alternative strips three feet wide, the spaces between the strips being cultivated and sown the succeeding season. The high degree of tilth makes the soil light and free for the roots to extend in every direction, and admits air and rain, which furnish abundance of organic food for the crop. Thorough tillage without manure will do more than manure without tillage; both together render the perfection of agriculture possible.

**Using Manure**—No very definite system of applying manure has been adopted in the State. Where it is in good condition, incorporating it with the soil is generally preferred. Many, however, prefer applying to the surface, and if it has been well composted and decomposed, there is no waste, except by being removed by rains. It is applied in both spring and autumn. Often it is applied to corn land just before planting. Rarely is wheat land manured immediately before sowing; it is thought better to apply to the previous crop. Grass land is manured in both spring and fall with varying results. Usually if the manure be well rotted, and the meadow be one which winter rains will not flood or wash, fall applications are preferred—otherwise, spring.

**Amount Applied.**—The rule should be: apply enough to produce a good crop on a few acres, rather than half a crop on many. The general practice should be to manure highly all the crop will bear, if you have it. The great advantage in mixing manure with the soil, instead of applying it as a top dressing, is, that incorporated with it, not only furnishes food for the plant, but improves the mechanical condition of the earth; neither is it likely to be washed away by rains.

**Crude Manures.**—Manures that have not been decomposed are too often applied, but the experience of most farmers is against it. In almost every case the growth of the plant is an unhealthful one. Crude manures do not mix well with the soil, and when taken up by the plant produce a rank growth. The hay growing about a sheep yard, or where fresh manure has been dropped in quantities, is not relished by stock. The rule is, that all manures, before being used, should be well rotted, to produce their best results.

**Artificial Fertilizers.**—These are, as yet, very little used. The farm produce goes to the city to find consumers, and because it is not returned again to the soil after having performed its function, but finds its way into the sewers and streams, or, decaying, pollutes the atmosphere and renders it unwholesome, the soil from which it comes loses its fertility. We need not expect there will be any great demand for this kind of manure at present. So long as the farm produces a moderate yield, so long will farmers content themselves in cultivating it. When exhausted, there are untried soils in the west waiting for the laborer, and it requires less brains to settle and exhaust new there than to restore worn-out lands. In the immediate neighborhood of towns, some advantage will be taken of the wasting fertilizers that exist there, and if manufactured so as to be in an available shape, and farmers understood their value, the demand for them would no doubt increase, for the following purposes: To speedily bring exhausted land to a state of fertility, by which it might be profitably cultivated; to bring land to its highest state of productiveness; to enable the farmer to raise those crops from which he might reap the highest returns; to enable him to increase the quantity of natural manure made on the farm.

The most valuable of all the artificial fertilizers which could be brought into use from cities would be bone manure, blood, and poudrette. The two former would be obtained from the slaughter-houses, the latter from prisons, in large quantities. The value of bones treated with sulphuric acid, as a manure, is so highly appreciated by English farmers, that they import them from every available source. South America, and the sea-board cities of the United States, have been gleaned of bones for British farms. The battle-fields of Europe have furnished a supply. Wherever bones could be had in quantities, for gathering and transportation—which would be no little expense—British enterprise has sought them. Why are bones so valuable? *Because they contain very important elements of food for plants in large quantities which do not exist in superabundance in the soil.* Blood, if collected from slaughtering establishments in all our cities and rightly manipulated, would form one of the most concentrated and valuable manures that could be used. Poudrette, though less concentrated, would be very valuable. In addition to these, many substances might be collected, and which could be manufactured into excellent fertilizers. If we would manure our own, and not foreign fields with these substances, we should reap the benefit ourselves. Guano is a valuable manure, but is not used in the State to any extent. Its high price, and the liability to get an inferior article, are objections to it. Besides, why go abroad for fertilizers when so many are wasting at our own doors? Until we save all of these we had better not go far from home for them. Whatever may be the value of artificial manures, our great dependance, except for the garden and for special purposes, will be upon those of home manufacture.

In addition to what precedes, on Manures and their value, the following, from Stöckhardt's Chemical Field Lectures, will present the importance of plant food in a clear light:—"If we give abundant and invigorating food to an animal, it becomes vigorous and fat; if on scanty and slightly nutritive food, it becomes poor and lean. It is precisely the same with plants. If they find *all* the substances required for their nourishment and full development in abundant quantity and in suitable form in the soil and air, they will grow up more vigorously, put forth more shoots, leaves, flowers, and fruits than when they meet with these substances, or even only one of them, in insufficient quantity. By rich and abundant food the farmer fattens his cattle; by rich and abundant food he can also fatten his plants. In this respect, plants are placed in the same circumstances as animals during stall feeding; they are confined to one fixed spot, and cannot quit it in order to seek in another place what may be wanting in this; therefore, if they are to grow luxuriantly, the farmer must take care that the food lies near enough for them to reach it by their roots."

There is one other benefit to be derived from the judicious use of manure not generally considered, and that is, the prevention of the diseases of plants and the ravages of insects. A plant well fed will resist the attacks of disease much better than the half starved, stunted one; and while insects are almost sure to attack a sickly plant, they are less likely to touch or greatly injure a healthy one. The excessive use of manure, or improper or crude manures, however, which give a forced growth, and consequently an unhealthy one, are more likely than any other to be injurious by both disease and insects.

EMIGRATION WEST.—We lose every year a part of our increase in population by emigration to the west. During the war this tide has been checked, to flow in a greater stream in another channel. It is mostly made up of the sons of farmers who can give their children a fair start in the world, young men of enterprise whom we can ill afford to lose. Until the State contains a population double, and perhaps quadruple what it now has; until our own resources are more fully developed, and until we have less useless land that ought to be reduced to a high degree of tilth, we have room enough and work enough for all. We would not discourage any man from going where he can better his condition, but hundreds of our western emigrants do not do this. Even those who become large landholders, and perhaps rich, do not necessarily improve their circumstances. The loss of opportunities for markets, for schools; the want of social intercourse, and the loss of health so often experienced by the western pioneer, together with the great amount of hard labor and deprivation of the comforts and necessaries of life, are never paid for by any amount of gain in dollars and cents. When men exile themselves and their children from the means of manly and womanly growth, they make sacrifices they cannot afford. Men in good circumstances, in Ohio, rarely better their condition by emigration to the west.

Going to the City.—While thousands go west, other thousands find their way into the cities, so that these are increasing in population more rapidly than the rural districts. The country not only feeds the city with food, but swells its population to an unnatural fullness. The city, on the other hand, sends occasionally to the country its retiring merchants, to spend their last days on the farm, often to the great advantage of agriculture. It is natural that young men should seek the city, where they can make a larger acquaintance, cultivate business habits, and add to their knowledge of human nature. The contact with men which a life in the city gives is an excellent means of education. Why is it however, that there is such a growing distaste for a country life, and a willingness to take almost any position in the city rather than to cultivate the soil? Is it because agriculture is a less intellectual pursuit? Rather, is it not just the reverse—a pursuit requiring so much knowledge of science to dignify and make it just what it should be, that, with our present system of education, few possess it? It does not require much knowledge of chemistry, of geology, of botany, to sell goods, and trade successfully; yet, to be a good farmer—to restore an exhausted soil, or keep a good one rich; to adapt plants to the soil, and feed them properly; to surround both animals and plants with the best conditions for full development—gives an opportunity for an application of the principles of all the natural sciences. Every crop raised can be made an exceedingly interesting experiment; every operation performed can be made the means by which mechanical principles can be used in the saving of labor. Few men possess brains enough, and knowledge enough, to make farming an intellectual and interesting pursuit. We are not yet sufficiently wedded to the soil; we do not yet love nature enough to wish to be constantly surrounded by her. We are charmed by the works of art the city affords us an opportunity to study; but the works of nature—storm and sunshine, growth and decay, beautiful sunsets and scenery—give us pictures for daily study such as no artist ever dared paint.

The excessive amount of labor required to be done on the farm, which dulls the intellect and blunts the feelings, drives many a young man from country to city. But this excessive labor is unnecessary. When the ax is dull, it is with great labor that the tree is felled; when sharp, it gives us pleasure to use it. When all the arrangements for doing labor on the farm are such that it is accomplished with little expenditure of strength—when we stand at the long end of the lever, instead of the short one, in farming—the amount of work to be done is comparatively small. What is needed on all farms is a *system* of labor which shall economise strength, instead of wasting it. This state of things cannot be expected until farmers have colleges of their own, in which to educate their sons. Our present system of education has done very much for agriculture, but it has done more for other professions. The branches usually taught in them have not given much knowledge of the soil, plants, geology, or indeed any sciences important to the farmer. Latin, Greek, and mathematics, to discipline the mind, have to a great extent usurped the place of a knowledge of the earth and its relation to plants and animals. These must be attended to for years, while a single term for each of the natural sciences has often been all that the pupil has allowed him. There is, however, a change for the better in this respect. It is found that chemistry, botany, geology, meteorology, anatomy, and physiology each discipline the mind most effectually, besides imparting information that can be used in almost every pursuit. It is being understood that that knowledge is most important which can be used to the greatest advantage. Hence the greater attention which is being paid to the natural sciences in many of our colleges and high schools; and the establishment of departments in them for their almost exclusive study will do much for improving the condition of agriculture. While, however, we wait for the endowment of schools of science and agriculture for the farmer, he need not go unlearned. Farmers' clubs, which are being established in many places, together with the study and observation necessary to make them valuable, will do much to increase a knowledge of agriculture. Twenty farmers meet, each with a few ideas on some subject relating to farming; they give what they know, and get in return what all know. Our State and county fairs are educational institutions from which the farmer learns much; and books on husbandry are so abundant and cheap, that a small sum spent yearly will provide the means of learning in abundance to all who wish it. These, together with extensive travel among the best farmers of the State and country, will so add to the farmer's stock of knowledge, that success in his vocation will be reduced almost to the certainty of a carefully conducted chemical experiment.

MANAGING MONEY.—There are thousands of farmers in Ohio whose debts are paid, and who have more or less money at interest. To have money to lend is better than to borrow; but it is often wiser to invest these surplus earnings in the improvement of the farm, such as will bring back good returns. Within the next few years thousands of dollars will be spent in underdraining; and, if judiciously done, it will be equivalent to adding many days to the length of the season, many acres to the farm by what will be reclaimed, and greatly to its productiveness. Such a use of it will be much better than to put it at usury, bringing not only its annual returns, but it cannot be lost. Capital is necessary to the successful prosecution of agriculture. The farmer needs it to stock his farm, to buy tools, to hire help, to use when otherwise he would be obliged to sell at a sacrifice what would bring more next month or year. The following statement, made by John Foster, of Cumberland, shows what can sometimes be done by the expenditure of a little money in farm improvement. Though the same results are not always attainable at so little expense, yet there are few farms which will not admit of much improvement. Mr. F. states:

"I have on my farm two creeks, which at one time ran zigzag nearly all over two hundred acres of my best bottom land, rendering useless twenty-six acres. By ditching, I have shortened the creeks, and saved over twenty-three acres, which is now the best land on my farm, and so rich that I have manured my garden from portions of it. I met with great opposition at first from those who thought ditching a humbug. The money gain is:

| | |
|---|---|
| Twenty-three acres made, at $60 per acre | $1,380 |
| From digging stumps and straightening roads I have gained seventeen acres more, worth | 1,020 |
| My farm contained 400 acres, and these improvements have increased the value of the whole of it $20 per acre, which makes | 8,000 |
| Thus giving an increase in value of | $10,400 |
| This was done at an expense of | 3,415 |
| Gain | $6,985 |

"But this is only a part of the gain, for I raised on sixty acres of the bottom land, which before ditching I could only plow in patches, sixty bushels of corn to the acre, which brought me $700, besides $100 worth of pumpkins, and $60 for pasture; in all, $880. The cost of raising the crop was $260. Thus the clear gain on sixty acres the first year I could work it was $620. Indeed, all my ditching and similar improvements have brought me back five times their cost, so that what I gain hereafter will be clear gain."

## *STATEMENT showing the amount of Wheat, Rye, Barley and Corn,* 1861.

| COUNTIES. | WHEAT. |  | RYE. |  | BARLEY. |  | CORN. |  |
|---|---|---|---|---|---|---|---|---|
|  | Acres. | Bushels. | Acres. | Bushels. | Acres. | Bushels. | Acres. | Bushels. |
| **Adams** ...... | 29,823 | 291,710 | 41 | 415 | 104 | 1,203 | 32,584 | 858,414 |
| **Allen**........ | 23,150 | 232,074 | 287 | 2,802 | 142 | 2,745 | 24,197 | 810,901 |
| **Ashland**...... | 25,684 | 299,020 | 1,052 | 13,159 | 1,123 | 25,071 | 21,791 | 602,873 |
| **Ashtabula**.... | 6,576 | 90,074 | 532 | 5,654 | 284 | 6,416 | 12,118 | 465,239 |
| **Athens**....... | 19,601 | 130,487 | 111 | 887 | 22 | 419 | 24,083 | 931,888 |
| **Auglaize**...... | 17,752 | 185 810 | 653 | 7,029 | 1,568 | 21,395 | 18,359 | 529,739 |
| **Belmont**...... | 23,183 | 242,174 | 1,566 | 17,014 | 1,580 | 33,603 | 27,330 | 1,051,558 |
| **Brown**....... | 32,013 | 290,142 | 455 | 3,976 | 290 | 7,443 | 39,626 | 1,221,581 |
| **Butler**........ | 45,860 | 533,843 | 350 | 3,422 | 10,569 | 224,639 | 58,093 | 2,425,379 |
| **Carroll**....... | 20,214 | 176,630 | 3,360 | 36,195 | 473 | 9,321 | 11,290 | 412,642 |
| **Champaign**... | 34,372 | 394 260 | 745 | 7,783 | 542 | 10,855 | 3 ,142 | 1,248,830 |
| **Clark**....... | 30,543 | 375,664 | 1,567 | 22,777 | 392 | 6,455 | 33,664 | 1,226,209 |
| **Clermont**..... | 25,136 | 196,726 | 767 | 7,267 | 150 | 8,174 | 37,624 | 1,168,792 |
| **Clinton**...... | 30 077 | 215,674 | 272 | 3,158 | 236 | 4,074 | 48,558 | 1,816,149 |
| **Columbiana**... | 20,027 | 218,299 | 3,532 | 40,001 | 376 | 8,115 | 14,945 | 491,481 |
| **Coshocton**.... | 32,884 | 230,075 | 1,572 | 13,482 | 177 | 2,847 | 31,499 | 867,905 |
| **Crawford** .... | 18,621 | 211,209 | 699 | 9,994 | 678 | 14,197 | 25,539 | 1,106,629 |
| **Cuyahoga** .... | 5,551 | 77,468 | 1,022 | 15,171 | 210 | 4,917 | 12,764 | 477,989 |
| **Darke** ....... | 39,342 | 437,004 | 2,297 | 25,720 | 1,970 | 33,327 | 36,480 | 1,157,833 |
| **Defiance**...... | 15,489 | 186,224 | 121 | 1,253 | 34 | 600 | 12,085 | 458,602 |
| **Delaware**. ... | 15,438 | 165,187 | 836 | 9,653 | 157 | 2,651 | 30,658 | 949,942 |
| **Erie** ......... | 14,478 | 236,842 | 203 | 2,973 | 448 | 11,484 | 20,545 | 711,782 |
| **Fairfield**...... | 39,289 | 372,241 | 1,538 | 18,748 | 724 | 13,866 | 42,703 | 1,264,566 |
| **Fayette**....... | 16,693 | 168,455 | 1,178 | 17,475 | 5 | 140 | 51,742 | 1,906,405 |
| **Franklin** ..... | 27,417 | 305,344 | 1,081 | 11,389 | 358 | 8,016 | 59,671 | 1,997,184 |
| **Fulton**........ | 14,292 | 191,156 | 127 | 1,472 | 80 | 1,440 | 11,784 | 474,804 |
| **Gallia** ....... | 27,097 | 230,794 | 134 | 1,406 | 40 | 632 | 20,948 | 492,320 |
| **Geauga**....... | 3,003 | 35,911 | 374 | 4,535 | 68 | 938 | 5,862 | 239,218 |
| **Greene**. ...... | 37,720 | 370,956 | 591 | 9,006 | 691 | 13,981 | 44,440 | 1,680,127 |
| **Guernsey**..... | 17,288 | 136,451 | 1,161 | 10,440 | 378 | 3,960 | 19,192 | 517,058 |
| **Hamilton** .... | 14,656 | 150,413 | 819 | 10,037 | 5 445 | 108,911 | 25,658 | 987,575 |
| **Hancock**. .... | 30,862 | 299,493 | 276 | 3,035 | 190 | 3,680 | 30,849 | 1,094,940 |
| **Hardin**....... | 14,084 | 144,287 | 359 | 3 981 | 31 | 643 | 19,969 | 573,677 |
| **Harrison** ..... | 14,114 | 151,425 | 871 | 10,447 | 197 | 4,813 | 14,374 | 469,418 |
| **Henry**......... | 10,791 | 96,576 | 30 | 304 | 3 | 62 | 8 499 | 322,911 |
| **Highland**..... | 45,189 | 314,535 | 398 | 3,743 | 30 | 852 | 55,827 | 1,732,651 |
| **Hocking**...... | 20,305 | 139,077 | 576 | 5,084 | 91 | 1,272 | 16,733 | 409,020 |
| **Holmes**....... | 26,916 | 258,243 | 2,008 | 22,511 | 626 | 12,245 | 18,569 | 593,167 |
| **Huron** ....... | 21,095 | 288,286 | 274 | 3,408 | 787 | 18,056 | 30,540 | 1,085,540 |
| **Jackson**...... | 20,543 | 162,721 | 54 | 394 | ...... | .... .... | 17,494 | 373,398 |
| **Jefferson**. .... | 16,879 | 211,788 | 2,037 | 16,770 | 1,785 | 44,525 | 14,183 | 512,497 |
| **Knox**........ | 25,317 | 243,644 | 2,044 | 20,672 | 248 | 4,133 | 31,740 | 855,558 |
| **Lake** ........ | 5 382 | 85,613 | 305 | 3,812 | 1,195 | 30,112 | 6,672 | 244,349 |
| **Lawrence**..... | 13,139 | 144,754 | 95 | 1,004 | 2 | 15 | 17,608 | 411,229 |
| **Licking**...... | 26,883 | 268,447 | 2 894 | 30,214 | 316 | 6,144 | 49,430 | 1,490 764 |
| **Logan**........ | 27,576 | 311,729 | 674 | 7,754 | 194 | 3,943 | 28,952 | 872,468 |
| **Lorain**. ..... | 11.517 | 153,614 | 142 | 1,921 | 351 | 7,681 | 15,450 | 504,470 |
| **Lucas** ....... | 9,864 | 141,172 | 136 | 1,622 | 180 | 2,666 | 7,692 | 299,774 |
| **Madison**...... | 9,621 | 99,024 | 996 | 12,132 | 16 | 249 | 37,759 | 1,616,050 |
| **Mahoning**.... | 10,938 | 123,991 | 839 | 9,205 | 395 | 9,085 | 11,496 | 401,853 |
| **Marion** ...... | 14,557 | 174,801 | 328 | 4,639 | 94 | 1,840 | 32,640 | 1,023,985 |
| **Medina** ...... | 12,999 | 160,331 | 588 | 8,666 | 421 | 8,996 | 14,793 | 553,445 |
| **Meigs** .. .... | 17,056 | 144,047 | 205 | 1,904 | 61 | 1,014 | 17,339 | 494,402 |
| **Mercer**....... | 23,122 | 212,933 | 783 | 8,318 | 897 | 11,609 | 20,511 | 641,994 |
| **Miami** ....... | 35,112 | 440,349 | 1,495 | 16,049 | 2,482 | 48,022 | 42,982 | 1,565,496 |
| **Monroe**....... | 16 340 | 118,915 | 870 | 9,247 | 303 | 3,713 | 19,705 | 506,863 |
| **Montgomery**.. | 34,455 | 468,873 | 1,425 | 17,425 | 3,018 | 59,044 | 35.450 | 1,315,868 |
| **Morgan**....... | 20,138 | 188,795 | 226 | 2,181 | 260 | 3,190 | 17,808 | 536,835 |

*STATEMENT showing the amount of Wheat, Rye, Barley and Corn,* 1861—*Con.*

| COUNTIES. | WHEAT. | | RYE. | | BARLEY. | | CORN. | |
|---|---|---|---|---|---|---|---|---|
| | Acres. | Bushels. | Acres. | Bushels. | Acres | Bushels. | Acres. | Bushels. |
| Morrow ...... | 12,763 | 115 987 | 531 | 5,578 | 172 | 3,584 | 21 992 | 652,070 |
| Muskingum... | 31,364 | 279,300 | 1,010 | 9,839 | 383 | 6,080 | 30,784 | 948,913 |
| Noble........ | 15,312 | 118,044 | 467 | 4,593 | 37 | 477 | 21,767 | 681,632 |
| Ottawa....... | 6,847 | 101,430 | 7 | 218 | 24 | 291 | 6,132 | 241,177 |
| Paulding..... | 4,212 | 45,399 | 57 | 74 0 | ...... | ...... | 4.771 | 180,368 |
| Perry........ | 22,764 | 192,293 | 760 | 6,219 | 154 | 3,054 | 19.919 | 572,269 |
| Pickaway .... | 29,891 | 324,599 | 476 | 5,477 | 58 | 1,027 | 76,230 | 2,462,528 |
| Pike......... | 14,826 | 123,880 | 119 | 1,037 | 2 | 31 | 24,113 | 725,773 |
| Portage ...... | 10,825 | 121,578 | 1,354 | 16,509 | 842 | 18,233 | 10,677 | 469,400 |
| Preble ....... | 36,711 | 388,982 | 987 | 11,117 | 983 | 17,970 | 38,319 | 1,346,359 |
| Putnam ...... | 145,559 | 168,242 | 213 | 2,231 | 42 | 665 | 17,814 | 604,584 |
| Richland .... | 31,347 | 355,155 | 2,073 | 26,021 | 1,233 | 23,669 | 24,295 | 739,061 |
| Ross ....... | 38 760 | 404,297 | 685 | 9,204 | 80 | 1,680 | 74,231 | 2,615,754 |
| Sandusky .... | 26,468 | 350,685 | 205 | 2,300 | 54 | 1,165 | 17.512 | 624,645 |
| Scioto ...... | 14,751 | 156,921 | 12 | 126 | 10 | 242 | 24.940 | 759,335 |
| Seneca....... | 43,286 | 488.824 | 371 | 4 478 | 372 | 7,376 | 26.921 | 849.172 |
| Shelby ..... | 22,521 | 280,810 | 1,301 | 16 370 | 680 | 12,400 | 22,851 | 580,674 |
| Stark ....... | 46,940 | 479,111 | 891 | 12,250 | 3,612 | 95,387 | 2 ,832 | 691,138 |
| Summit ..... | 21,662 | 272,024 | 768 | 10,886 | 1,166 | 35,871 | 11,638 | 460,816 |
| Trumbull ... | 6,436 | 62,023 | 1,114 | 11,297 | 46 | 831 | 9 761 | 397,244 |
| Tuscarawas... | 36 806 | 343,979 | 1,613 | 16,913 | 453 | 9,869 | 21 268 | 662,523 |
| Union........ | 13 935 | 133,949 | 550 | 5,812 | 16 | 221 | 30.585 | 834,790 |
| Van Wert ... | 13 242 | 128,815 | 224 | 2,295 | 114 | 1,811 | 11,706 | 443,694 |
| Vinton....... | 10.041 | 69 677 | 93 | 751 | 2 | 15 | 13,654 | 305,927 |
| Warren....... | 34,197 | 337,077 | 290 | 2,678 | 4,675 | 99,172 | 46.4[illegible]5 | 1,883,418 |
| Washington .. | 23,631 | 156 499 | 1,445 | 8.703 | 106 | 2,231 | 26,318 | 735,032 |
| Wayne....... | 40,362 | 511,388 | 1,060 | 13,575 | 1,142 | 22,606 | 26.897 | 730,809 |
| Williams .... | 17,189 | 219.592 | 291 | 3,483 | 89 | 1,551 | 13,759 | 477,732 |
| Wood ...... | 15,09 | 188,393 | 114 | 1,531 | 256 | 3,895 | 18,82 | 668 014 |
| Wyandot..... | 17,866 | 203,540 | 478 | 5,632 | 220 | 4,294 | 22,785 | 801,361 |
| | 1 933 696 | 20,048 273 | 69 266 | 778,607 | 60,514 | 1,255,185 | 2,269,284 | 75 208,549 |

## *STATEMENT showing the amount of Buckwheat, Oats, and Hay,* 1861.

| COUNTIES. | BUCKWHEAT. | | OATS. | | MEADOW LANDS. | |
|---|---|---|---|---|---|---|
| | Acres. | Bushels | Acres. | Bushels. | Acres. | Tons Hay. |
| Adams | 70 | 873 | 6,274 | 112,320 | 7,061 | 6,905 |
| Allen | 361 | 5,825 | 4,366 | 104,722 | 11,412 | 12,706 |
| Ashland | 534 | 8,352 | 14 162 | 417,282 | 24,963 | 31,168 |
| Ashtabula | 995 | 12,194 | 9,552 | 257,927 | 49,169 | 48,826 |
| Athens | 1,454 | 14,529 | 5,920 | 141,267 | 15,069 | 19,028 |
| Auglaize | 437 | 5,219 | 5,719 | 128 766 | 7,689 | 8,891 |
| Belmont | 1,504 | 18,003 | 18,036 | 453,358 | 18,359 | 20,460 |
| Brown | 199 | 2,412 | 11,391 | 202 218 | 9,351 | 8,867 |
| Butler | 337 | 6,217 | 8 827 | 203,884 | 7,983 | 9,301 |
| Carroll | 948 | 1 ,124 | 15,690 | 378,424 | 19,100 | 24,814 |
| Champaign | 246 | 3,777 | 7,370 | 206,777 | 13,89[illegible] | 17,179 |
| Clarke | 75 | 1,093 | 6,078 | 187,592 | 12,756 | 16,798 |
| Clermont | 415 | 6,535 | 13,757 | 273,573 | 15,560 | 16,358 |
| Clinton | 437 | 7,196 | 5,519 | 138,847 | 10,659 | 12 966 |
| Columbiana | 1,305 | 17,730 | 16,891 | 467,901 | 30 466 | 38,764 |
| Coshocton | 1,902 | 15,648 | 10,578 | 224,196 | 15 756 | 17,925 |
| Crawford | 696 | 13,232 | 12,256 | 399,118 | 21,940 | 30,396 |
| Cuyahoga | 412 | 6,872 | 8,933 | 226,870 | 35,112 | 40,064 |
| Darke | 571 | 8,456 | 10,113 | 208,489 | 10,464 | 11,864 |
| Defiance | 417 | 6,709 | 3,253 | 81,983 | 8,771 | 10,004 |
| Delaware | 633 | 8,039 | 6,683 | 180,357 | 19,624 | 22,874 |
| Erie | 527 | 8,085 | 5,367 | 139,239 | 11,385 | 15,862 |
| Fairfield | 181 | 2 403 | 9,032 | 200,851 | 14 563 | 18,053 |
| Fayette | 109 | 1,588 | 2,059 | 47,586 | 7,370 | 7,420 |
| Franklin | 369 | 5,287 | 6,610 | 179,682 | 15,183 | 17,454 |
| Fulton | 807 | 13 243 | 2,282 | 60,161 | 14,649 | 18,731 |
| Gallia | 368 | 3 914 | 6,655 | 116,400 | 18,863 | 9,403 |
| Geauga | 637 | 9,371 | 5 347 | 135,457 | 37,121 | 42,304 |
| Greene | 121 | 1,686 | 5,635 | 155,084 | 9,010 | 11,867 |
| Guernsey | 1,356 | 14,507 | 13 058 | 240,622 | 18,708 | 18,365 |
| Hamilton | 448 | 5 990 | 6,581 | 151 594 | 13 830 | 15 861 |
| Hancock | 512 | 8,696 | 6,613 | 175 979 | 15,928 | 19,326 |
| Hardin | 336 | 6,354 | 3,936 | 105,712 | 8,916 | 10 254 |
| Harrison | 561 | 6 469 | 9,725 | 249,635 | [illegible] | 21,786 |
| Henry | 268 | 4,899 | 1,296 | 30,577 | 4 205 | 4,944 |
| Highland | 192 | 2,576 | 5,797 | 106,015 | 13,779 | 14,030 |
| Hocking | 653 | 7,136 | 5,759 | 101,088 | 8,351 | 9,132 |
| Holmes | 951 | 14,330 | 13,106 | 365,93[illegible] | 20,289 | 24,016 |
| Huron | 629 | 9,879 | 13,091 | 380,940 | 30,659 | 39,964 |
| Jackson | 226 | 2,117 | 6,229 | 103,700 | 9 531 | 9,820 |
| Jefferson | 420 | 5,022 | 11,457 | 301,418 | 18 239 | 21,995 |
| Knox | 856 | 9 308 | 11,161 | 261,331 | 20,710 | 24,340 |
| Lake | 401 | 6,314 | 3,112 | 80,917 | 16 402 | 20,895 |
| Lawrence | 160 | 1,421 | 3,635 | 68,070 | 4,168 | 4,583 |
| Licking | 845 | 10,806 | 13,281 | 329,129 | 26,246 | 38,735 |
| Logan | 298 | 4,321 | 5,666 | 149,122 | 14,025 | 17,225 |
| Lorain | 191 | 3 200 | 7,007 | 160,753 | 32 936 | 37,582 |
| Lucas | 54 | 9 217 | 1,953 | 51,332 | 10,740 | 14,240 |
| Madison | 659 | 3,873 | 2,407 | 59,111 | 11,662 | 12,795 |
| Mahoning | 643 | 7,886 | 12,039 | 333 659 | 33,164 | 41 522 |
| Marion | 273 | 4,377 | 6,267 | 199,478 | 17 224 | 19,759 |
| Medina | 251 | 3,461 | 11,373 | 307,789 | 32,921 | 37,739 |
| Meigs | 661 | 8,019 | 4,741 | 83,817 | 12,975 | 16,159 |
| Mercer | 378 | 6 069 | 5,154 | 112,743 | 7,546 | 8,493 |
| Miami | 221 | 3,666 | 9,710 | 287,309 | 8 962 | 10,529 |
| Monroe | 2,166 | 23,646 | 14,133 | 261,883 | 11,496 | 10,691 |
| Montgomery | 163 | 2,831 | 12,066 | 308,826 | 11,169 | 12,387 |
| Morgan | 885 | 10,103 | 7,227 | 131,913 | 14,786 | 15,634 |

*STATEMENT showing the amount of Buckwheat, Oats, and Hay,* 1861.—Con.

| COUNTIES. | BUCKWHEAT. | | OATS. | | MEADOW LANDS. | |
|---|---|---|---|---|---|---|
| | Acres. | Bushels. | Acres. | Bushels. | Acres. | Tons Hay. |
| Morrow | 826 | 11,854 | 10,004 | 253,596 | 25,243 | 28,357 |
| Muskingum | 782 | 8,360 | 11,624 | 220,965 | 21,120 | 20,447 |
| Noble | 1,226 | 12,989 | 9,914 | 98,889 | 12,869 | 13,287 |
| Ottawa | 169 | 2,988 | 929 | 27,917 | 4,610 | 6,953 |
| Paulding | 219 | 3,562 | 387 | 8,717 | 2,541 | 2,793 |
| Perry | 923 | 8,703 | 7,583 | 132,053 | 15,011 | 16,133 |
| Pickaway | 162 | 2,534 | 3,262 | 73,501 | 7,541 | 8,019 |
| Pike | 167 | 1,547 | 5,140 | 78,885 | 4,410 | 4,247 |
| Portage | 571 | 8,907 | 9,568 | 261,834 | 41,526 | 45,217 |
| Preble | 262 | 5,884 | 8,684 | 217,828 | 6,570 | 7,294 |
| Putnam | 304 | 5,339 | 1,891 | 43,228 | 8,250 | 8,719 |
| Richland | 989 | 17 459 | 19,210 | 491,942 | 27,740 | 33,906 |
| Ross | 198 | 2,253 | 5,319 | 103,916 | 8,254 | 9,326 |
| Sandusky | 701 | 11,709 | 7,970 | 144,230 | 15,614 | 19,321 |
| Scioto | 325 | 2,682 | 5,575 | 88,819 | 5,664 | 6,683 |
| Seneca | 491 | 10,136 | 12,155 | 344,839 | 27,396 | 30,848 |
| Shelby | 360 | 7,297 | 10,050 | 232,260 | 7,189 | 7,918 |
| Stark | 553 | 8,168 | 22,631 | 579,274 | 35,028 | 46,753 |
| Summit | 365 | 6,524 | 11,858 | 328,284 | 28,716 | 34,515 |
| Trumbull | 1,929 | 14,245 | 10,934 | 269,941 | 52,932 | 56,401 |
| Tuscarawas | 1,274 | 19,305 | 17,554 | 459,779 | 23,851 | 27,885 |
| Union | 335 | 4,881 | 5,012 | 111,903 | 13,648 | 15,769 |
| Van Wert | 448 | 7,396 | 1,459 | 36,313 | 5,920 | 6,384 |
| Vinton | 475 | 4,629 | 3,701 | 60,007 | 7,530 | 8,429 |
| Warren | 506 | 8,501 | 9,784 | 237,516 | 9,929 | 11,785 |
| Washington | 2,497 | 28,160 | 11,374 | 197,971 | 17,578 | 19,344 |
| Wayne | 630 | 8,750 | 22,287 | 738,364 | 35,371 | 46,468 |
| Williams | 356 | 6,435 | 4,222 | 115,183 | 13,925 | 17,236 |
| Wood | 994 | 18,616 | 3,705 | 99,015 | 10,504 | 13,396 |
| Wyandot | 398 | 7,735 | 4,519 | 145,153 | 14,816 | 17,079 |
| Totals | 51,947 | 701,663 | 723,874 | 17,832,847 | 1,462,481 | 1,711,015 |

## *Sheep Killed and Injured by Dogs in* 1861.

| Counties. | Sheep killed by dogs. | | Sheep injured by dogs. | | Aggregate amount of injury to sheep by dogs. |
|---|---|---|---|---|---|
| | No. | Value. | No. | Value. | |
| Adams | 202 | $282 00 | 64 | $45 00 | $327 00 |
| Allen | 325 | 593 00 | 194 | 159 50 | 752 50 |
| Ashland | 222 | 474 50 | 137 | 132 50 | 607 00 |
| Ashtabula | 272 | 541 00 | 109 | 107 00 | 648 00 |
| Athens | 453 | 868 00 | 208 | 121 00 | 989 00 |
| Auglaize | 277 | 371 25 | 55 | 47 00 | 418 25 |
| Belmont | 485 | 985 50 | 167 | 236 25 | 1,221 75 |
| Brown | 341 | 603 00 | 100 | 94 50 | 697 50 |
| Butler | 298 | 739 50 | 80 | 140 00 | 879 50 |
| Carroll | 276 | 626 00 | 374 | 474 50 | 1,100 50 |
| Champaign | 321 | 729 00 | 1,000 | 552 00 | 1,281 00 |
| Clark | 452 | 1,157 00 | 745 | 682 00 | 1,839 00 |
| Clermont | 280 | 604 00 | 81 | 99 00 | 703 00 |
| Clinton | 731 | 1,562 00 | 1,011 | 1,046 00 | 2,608 00 |
| Columbiana | 437 | 950 50 | 320 | 416 00 | 1,366 50 |
| Coshocton | 338 | 700 00 | 126 | 262 00 | 962 00 |
| Crawford | 381 | 650 00 | 1,219 | 298 00 | 948 00 |
| Cuyahoga | 541 | 1,096 00 | 262 | 286 00 | 1,382 00 |
| Darke | 977 | 448 50 | 71 | 84 00 | 532 50 |
| Defiance | 207 | 350 00 | 23 | 18 00 | 368 00 |
| Delaware | 573 | 1,358 00 | 409 | 490 00 | 1,848 00 |
| Erie | 271 | 457 00 | 76 | 54 00 | 511 00 |
| Fairfield | 357 | 703 00 | 57 | 63 00 | 766 00 |
| Fayette | 350 | 696 00 | 137 | 183 00 | 879 00 |
| Franklin | 394 | 744 00 | 183 | 247 00 | 989 00 |
| Fulton | 122 | 471 00 | 47 | 45 00 | 516 00 |
| Gallia | 635 | 962 25 | 151 | 116 75 | 1,079 00 |
| Geauga | 131 | 292 00 | 102 | 144 50 | 436 50 |
| Greene | 526 | 1,013 00 | 429 | 431 00 | 1,444 00 |
| Guernsey | 270 | 541 50 | 377 | 331 00 | 872 50 |
| Hamilton | 63 | 123 50 | 21 | 21 25 | 144 75 |
| Hancock | 470 | 661 00 | 247 | 198 75 | 859 75 |
| Hardin | 141 | 280 00 | 33 | 35 00 | 315 00 |
| Harrison | 154 | 375 00 | 611 | 301 00 | 676 00 |
| Henry* | ... | ...... | ... | ...... | ...... |
| Highland | 460 | 738 50 | 160 | 178 25 | 916 75 |
| Hocking | 221 | 330 50 | 37 | 37 00 | 357 50 |
| Holmes | 177 | 304 62 | 114 | 136 50 | 441 12 |
| Huron | 642 | 1,457 00 | 348 | 430 00 | 1,887 00 |
| Jackson | 700 | 960 75 | 157 | 171 50 | 1,132 25 |
| Jefferson | 495 | 1,050 00 | 407 | 705 00 | 1,755 00 |
| Knox | 462 | 975 00 | 461 | 598 00 | 1,573 00 |
| Lake | 266 | 531 00 | 193 | 152 00 | 683 00 |
| Lawrence | 510 | 684 75 | 92 | 88 00 | 772 75 |
| Licking | 762 | 1,655 00 | 646 | 763 00 | 2,418 00 |
| Logan | 331 | 715 50 | 223 | 305 50 | 1,021 00 |
| Lorain | 447 | 1,037 00 | 344 | 361 00 | 1,398 00 |
| Lucas | 244 | 479 00 | 123 | 98 00 | 577 00 |
| Madison | 300 | 671 00 | 172 | 202 00 | 873 00 |
| Mahoning | 449 | 959 00 | 948 | 1,282 00 | 2,241 00 |
| Marion | 427 | 758 00 | 188 | 164 00 | 922 00 |
| Medina | 353 | 707 00 | 229 | 292 75 | 999 75 |
| Meigs | 235 | 358 00 | 75 | 63 00 | 421 00 |
| Mercer | 223 | 320 50 | 95 | 111 00 | 431 50 |
| Miami | 202 | 430 00 | 107 | 122 00 | 552 00 |
| Monroe | 314 | 563 00 | 105 | 111 00 | 674 00 |
| Montgomery | 337 | 587 00 | 68 | 67 00 | 654 00 |

* No report from this county.

## *Sheep Killed and Injured by Dogs in* 1861—Continued.

| COUNTIES. | SHEEP KILLED BY DOGS. | | SHEEP INJURED BY DOGS. | | Aggregate amount of injury to sheep by dogs. |
|---|---|---|---|---|---|
| | No. | Value. | No. | Value. | |
| Morgan | 286 | $624 00 | 283 | $469 00 | $1,093 00 |
| Morrow | 345 | 732 00 | 438 | 426 00 | 1,158 00 |
| Muskingum | 582 | 1,369 00 | 525 | 621 50 | 1,990 50 |
| Noble | 438 | 790 50 | 202 | 250 50 | 1,041 00 |
| Ottawa | 107 | 154 00 | 15 | 13 00 | 167 00 |
| Paulding | 22 | 32 00 | 2 | 2 00 | 34 00 |
| Perry | 459 | 970 00 | 255 | 464 00 | 1,434 00 |
| Pickaway | 624 | 1,239 00 | 313 | 295 50 | 1,534 50 |
| Pike | 237 | 328 25 | 26 | 31 00 | 359 25 |
| Portage | 256 | 613 00 | 317 | 431 50 | 1,044 50 |
| Preble | 257 | 524 50 | 97 | 138 75 | 663 25 |
| Putnam | 190 | 308 50 | 58 | 74 00 | 382 50 |
| Richland | 704 | 1,463 00 | 453 | 510 00 | 1,973 00 |
| Ross | 753 | 1,416 50 | 312 | 238 00 | 1,654 50 |
| Sandusky | 206 | 302 00 | 166 | 176 00 | 485 00 |
| Scioto | 439 | 536 00 | 56 | 48 50 | 534 50 |
| Seneca | 695 | 1,391 00 | 554 | 680 00 | 2,071 00 |
| Shelby | 204 | 378 00 | 94 | 65 50 | 443 50 |
| Stark | 669 | 1,187 50 | 578 | 541 00 | 1,728 50 |
| Summit | 444 | 948 00 | 181 | 340 00 | 1,288 00 |
| Trumbull | 535 | 1,265 50 | 512 | 622 00 | 1,887 50 |
| Tuscarawas | 442 | 856 00 | 229 | 284 50 | 1,140 50 |
| Union | 348 | 756 00 | 213 | 281 50 | 1,037 50 |
| Van Wert | 186 | 281 00 | 72 | 62 00 | 343 00 |
| Vinton | 374 | 588 75 | 76 | 74 00 | 662 75 |
| Warren | 546 | 1,249 00 | 339 | 429 00 | 1,675 00 |
| Washington | 553 | 885 00 | 201 | 210 00 | 1,095 00 |
| Wayne | 441 | 856 00 | 327 | 316 26 | 1,172 25 |
| Williams | 124 | 164 50 | 40 | 45 50 | 210 00 |
| Wood | 459 | 758 50 | 189 | 195 50 | 954 00 |
| Wyandot | 455 | 982 00 | 2,713 | 465 00 | 1,447 00 |
| Totals | 31,750 | .............. | 24,254 | ......... .... | $86,434 00 |

## *STATEMENT showing the amount of Potatoes, Butter, Cheese and Coal, for* 1861.

| COUNTIES. | POTATOES. | | BUTTER. | CHEESE. | COAL. |
|---|---|---|---|---|---|
| | Acres. | Bushels. | Pounds | Pounds. | Bushels. |
| **Adams** | 319 | 14,529 | 159,369 | 4,346 | ........ |
| **Allen** | 693 | 71,722 | 326,920 | 29,378 | ........ |
| **Ashland** | 990 | 91,443 | 565,609 | 117,037 | ........ |
| **Ashtabula** | 1,511 | 153,916 | 885,085 | 2,745,026 | ........ |
| **Athens** | 8 | 76,672 | 420,673 | 123,162 | 1,573,311 |
| **Auglaize** | 7 | 55,659 | 190,336 | 4,392 | ........ |
| **Belmont** | 1,125 | 106,401 | 561,010 | 19,241 | 802,400 |
| **Brown** | 531 | 28,414 | 390,766 | 13,978 | ........ |
| **Butler** | 993 | 66,540 | 443,004 | 5,204 | ........ |
| **Carroll** | 607 | 61,653 | 565,653 | 27,945 | 126,140 |
| **Champaign** | 479 | 41,901 | 355,845 | 62,625 | ........ |
| **Clark** | 687 | 54,149 | 313,413 | 14,777 | ........ |
| **Clermont** | 3,563 | 152,446 | 345,189 | 3,855 | ........ |
| **Clinton** | 608 | 38,581 | 403,883 | 36,797 | ........ |
| **Columbiana** | 1,032 | 110,713 | 5 4,185 | 25,806 | 372,153 |
| **Coshocton** | 821 | 72,054 | 446,995 | 13,616 | 506,721 |
| **Crawford** | 975 | 95,948 | 493,282 | 5,998 | ........ |
| **Cuyahoga** | 3,119 | 239,510 | 822,503 | 1,185,861 | ........ |
| **Darke** | 757 | 59,964 | 396,042 | 12,593 | 20 |
| **Defiance** | 723 | 69,629 | 252,908 | 23,125 | ........ |
| **Delaware** | 793 | 44,281 | 450,147 | 29,304 | ........ |
| **Erie** | 1,252 | 110,068 | 347,633 | 31,315 | ........ |
| **Fairfield** | 868 | 56,206 | 517,628 | 12,047 | ........ |
| **Fayette** | 244 | 21,114 | 217,242 | 6,160 | ........ |
| **Franklin** | 1,836 | 116,235 | 551,343 | 11,463 | ........ |
| **Fulton** | 741 | 92,378 | 318,145 | 64,818 | ........ |
| **Gallia** | 796 | 58,494 | 239,802 | 34,785 | 72,423 |
| **Geauga** | 871 | 89,381 | 675,700 | 4,110,450 | 3,159 |
| **Greene** | 700 | 85,440 | 376,934 | 13,393 | ........ |
| **Guernsey** | 591 | 37,589 | 419,144 | 17,993 | 160,769 |
| **Hamilton** | 2,548 | 153,030 | 285,102 | 1,395 | ........ |
| **Hancock** | 1,000 | 107,270 | 445,969 | 25,328 | ........ |
| **Hardin** | 547 | 48,873 | 186,100 | 14,093 | ........ |
| **Harrison** | 398 | 40,296 | 363,974 | 14,599 | 251,766 |
| **Henry** | 452 | 47,519 | 133,834 | 5,860 | ........ |
| **Highland** | 513 | 32,754 | 333,447 | 12,469 | ........ |
| **Hocking** | 525 | 30,034 | 248,849 | 7,442 | 457,500 |
| **Holmes** | 782 | 82,021 | 544,230 | 21,608 | 77,830 |
| **Huron** | 1,358 | 153,653 | 662,962 | 95,500 | ........ |
| **Jackson** | 416 | 27,677 | 176,012 | 21,980 | 118,370 |
| **Jefferson** | 1,244 | 77,136 | 307,998 | 37,956 | 523,607 |
| **Knox** | 804 | 62,403 | 443,518 | 17,779 | ........ |
| **Lake** | 1,322 | 121,005 | 247,072 | 278,834 | ........ |
| **Lawrence** | 484 | 26,286 | 111,862 | 1,227 | 139,930 |
| **Licking** | 1,097 | 96,677 | 767,564 | 121,345 | 2,950 |
| **Logan** | 525 | 44,156 | 353,699 | 13,197 | ........ |
| **Lorain** | 1,296 | 105,966 | 956,426 | 1,098,976 | ........ |
| **Lucas** | 1,012 | 95,816 | 176,961 | 29,490 | ........ |
| **Madison** | 416 | 31,189 | 156,790 | 104,201 | ........ |
| **Mahoning** | 1,078 | 102,421 | 522,657 | 152,925 | 3,651,548 |
| **Marion** | 682 | 54,003 | 298,749 | 15,375 | ........ |
| **Medina** | 1,010 | 85,120 | 795,545 | 677,182 | ........ |
| **Meigs** | 1,086 | 71,302 | 289,094 | 55,827 | 2,500 |
| **Mercer** | 719 | 66,560 | 176,232 | 10,412 | 6,412,300 |
| **Miami** | 765 | 58,847 | 363,270 | 16,758 | ........ |
| **Monroe** | 879 | 47,615 | 274,046 | 118,954 | 43,420 |
| **Montgomery** | 864 | 61,978 | 412,620 | 981 | ........ |
| **Morgan** | 602 | 43,363 | 447,578 | 61,784 | 121,245 |

## *STATEMENT showing the amount of Potatoes, Butter, Cheese and Coal—Con.*

| COUNTIES. | POTATOES. | | BUTTER. | CHEESE. | COAL. |
|---|---|---|---|---|---|
| | Acres. | Bushels. | Pounds. | Pounds. | Bushels. |
| Morrow | 762 | 69,077 | 606,819 | 42,151 | ........ |
| Muskingum | 1,217 | 67,328 | 525,508 | 19,663 | 861,360 |
| Noble | 563 | 34,691 | 367,707 | 48,825 | 231,974 |
| Ottawa | 459 | 41,700 | 99,617 | 2,664 | ........ |
| Paulding | 313 | 28,419 | 57,719 | 2,615 | ........ |
| Perry | 755 | 50,904 | 435,783 | 17,940 | 517,112 |
| Pickaway | 520 | 41,289 | 285,832 | 4,043 | ........ |
| Pike | 423 | 24,662 | 100 470 | 3,573 | 100 |
| Portage | 1,359 | 155,663 | 816,137 | 2,818,012 | ........ |
| Preble | 445 | 36,573 | 408,912 | 5,392 | ........ |
| Putnam | 1,287 | 54,503 | 210,741 | 7,068 | ........ |
| Richland | 1,277 | 130,998 | 611,295 | 19,173 | ........ |
| Ross | 600 | 44,801 | 315,693 | 14,806 | ........ |
| Sandusky | 1,137 | 122,140 | 263,611 | 8,226 | ........ |
| Scioto | 873 | 60,097 | 113,133 | 2,446 | 20,948 |
| Seneca | 1,235 | 117,408 | 603,303 | 16,421 | ........ |
| Shelby | 627 | 45,582 | 201,872 | 4,758 | ........ |
| Stark | 1,256 | 122,869 | 738,401 | 87,638 | 1,169,900 |
| Summit | 1,168 | 120,254 | 641,145 | 1,369,684 | 265,489 |
| Trumbull | 1,551 | 138,353 | 907,170 | 3,998,355 | 3,311,135 |
| Tuscarawas | 858 | 80,118 | 650,802 | 52,885 | 436,458 |
| Union | 612 | 35,811 | 286,689 | 98,350 | ........ |
| Van Wert | 494 | 53,978 | 207,585 | 12,361 | ........ |
| Vinton | 377 | 21,733 | 123,522 | 8,405 | 66,625 |
| Warren | 1,116 | 70,264 | 426,215 | 14,757 | ........ |
| Washington | 2,320 | 136,680 | 457,271 | 68,772 | 132,117 |
| Wayne | 1,217 | 106 273 | 705,468 | 42,007 | 833,450 |
| Williams | 671 | 86,382 | 331,606 | 31,339 | ........ |
| Wood | 822 | 91 553 | 347,492 | 19,463 | ........ |
| Wyandot | 541 | 66,809 | 237,150 | 7,838 | ........ |
| | 81,155 | 6,594,922 | 35,523,183 | 20,676,815 | 23,266,732 |

*STATEMENT showing the number of Domestic Animals for* 1862.

| COUNTIES. | HORSES. | CATTLE. | MULES. | SHEEP. | HOGS. |
|---|---|---|---|---|---|
| | Number. | Number. | Number. | Number. | Number. |
| Adams | 7,168 | 17,153 | 344 | 19,724 | 37,814 |
| Allen | .......... | .......... | ...... | .......... | .......... |
| Ashland | 9,013 | 23,627 | 54 | 76,205 | 29,863 |
| Ashtabula | 9,426 | 41,783 | 120 | 70,374 | 7,473 |
| Athens | .......... | .......... | ...... | .......... | .......... |
| Auglaize | 6,414 | 16,547 | 304 | 19,791 | 29,206 |
| Belmont | 11,515 | 23,755 | 137 | 102,528 | 32,918 |
| Brown | 9,077 | 15,995 | 367 | 19,131 | 45,803 |
| Butler | 11,820 | 15,850 | 281 | 65,068 | 56,314 |
| Carroll | 5,877 | 15,752 | 32 | 117,318 | 13,339 |
| Champaign | 9,299 | 19,023 | 256 | 41,862 | 36,933 |
| Clarke | 8,947 | 18,256 | 411 | 48,904 | 39,032 |
| Clermont | 10,414 | 15,741 | 429 | 11,365 | 46,673 |
| Clinton | 9,887 | 18,125 | 374 | 86,203 | 63,216 |
| Columbiana | 9,633 | 21,455 | 147 | 151,052 | 18,498 |
| Coshocton | 9,299 | 25,046 | 135 | 90,603 | 35,040 |
| Crawford | 8,637 | 22,497 | 85 | 63,061 | 40,004 |
| Cuyahoga | 11,755 | 29,757 | 81 | 55,375 | 12,395 |
| Darke | 10,696 | 23,866 | 83 | 18,683 | 57,679 |
| Defiance | 4,429 | 13,224 | 18 | 12,615 | 19,813 |
| Delaware | 9,031 | 21,069 | 204 | 67,377 | 32,926 |
| Erie | 6,217 | 12,346 | 37 | 43,826 | 13,666 |
| Fairfield | 11,464 | 27,679 | 113 | 30,725 | 53,942 |
| Fayette | 9,444 | 21,603 | 317 | 42,299 | 68,245 |
| Franklin | 15,580 | 26,389 | 356 | 26,625 | 74,699 |
| Fulton | .......... | .......... | ...... | .......... | .......... |
| Gallia | 5,684 | 14,877 | 173 | 19,545 | 20,029 |
| Geauga | 6,271 | 34,832 | 132 | 47,588 | 4 768 |
| Greene | 10,351 | 19,575 | 541 | 27,101 | 63,304 |
| Guernsey | 8,565 | 19,699 | 76 | 111,415 | 21,682 |
| Hamilton | 16,260 | 19,161 | 441 | 4,065 | 44,915 |
| Hancock | 10,715 | 26,277 | 76 | 40,089 | 45,943 |
| Hardin | 5,442 | 15,609 | 194 | 20,055 | 27,407 |
| Harrison | 6,092 | 12,790 | 61 | 176,969 | 13,056 |
| Henry | 2,870 | 8,758 | 25 | 6,428 | 11,135 |
| Highland | 11,785 | 22,403 | 540 | 23,881 | 66,070 |
| Hocking | 5,285 | 13,338 | 79 | 22,711 | 21,894 |
| Holmes | 7,654 | 20,541 | 62 | 55,602 | 26,487 |
| Huron | 10,581 | 23,764 | 183 | 101,320 | 27,105 |
| Jackson | 4,778 | 15,980 | 115 | 14,937 | 17,991 |
| Jefferson | 6,739 | 15,370 | 28 | 142,658 | 15,980 |
| Knox | 10,639 | 22,145 | 133 | 103,070 | 34,212 |
| Lake | 4,763 | 14,131 | 41 | 40,326 | 4,978 |
| Lawrence | 3,506 | 12,251 | 176 | 9,740 | 18,871 |
| Licking | 14,226 | 32,133 | 110 | 181,905 | 47,551 |
| Logan | 8,681 | 20,347 | 473 | 38,273 | 34,563 |
| Lorain | 10,302 | 35,703 | 50 | 106,355 | 16,115 |
| Lucas | 4,160 | 10,328 | 27 | 11,205 | 10,002 |
| Madison | 7,662 | 21,266 | 545 | 87,351 | 41,472 |
| Mahoning | 8 580 | 24,568 | 281 | 91,988 | 11,944 |
| Marion | 7,548 | 20,438 | 104 | 68,701 | 56,056 |
| Medina | 8,859 | 27,241 | 51 | 108,404 | 14,478 |
| Meigs | 4,972 | 13,648 | 157 | 17,539 | 17,225 |
| Mercer | 6,097 | 14,993 | 75 | 15,462 | 37,307 |
| Miami | 9,746 | 16,634 | 461 | 13,432 | 40,783 |
| Monroe | 6,476 | 17,526 | 57 | 26,846 | 18,022 |
| Montgomery | 12,000 | 19,726 | 148 | 8,667 | 50,592 |
| Morgan | 7,600 | 20,942 | 154 | 53,987 | 24,435 |

## *STATEMENT showing the number of Domestic Animals for* 1862—Continued.

| Counties. | Horses. | Cattle. | Mules. | Sheep. | Hogs. |
|---|---|---|---|---|---|
| | Number. | Number. | Number. | Number. | Number. |
| Morrow | 8,751 | 23,241 | 112 | 76,916 | 28,057 |
| Muskingum | 12,674 | 35,841 | 114 | 123,715 | 44,099 |
| Noble | 7,873 | 20,089 | 68 | 39,880 | 23,415 |
| Ottawa | 2,427 | 6,433 | 1 | 12,962 | 10,640 |
| Paulding | 1,506 | 6,239 | 8 | 2,468 | 8,800 |
| Perry | 7,323 | 22,610 | 54 | 58,859 | 26,743 |
| Pickaway | 11,157 | 27,947 | 187 | 17,460 | 72,790 |
| Pike | 5,139 | 11,002 | 172 | 13,666 | 31,494 |
| Portage | 8,136 | 33,355 | 116 | 92,503 | 9,468 |
| Preble | 9,353 | 16,469 | 85 | 11,626 | 53,128 |
| Putnam | 5,165 | 16,708 | 61 | 15,014 | 28,207 |
| Richland | 10,830 | 28,172 | 148 | 74,662 | 41,332 |
| Ross | 12,440 | 25,713 | 342 | 22,210 | 79,447 |
| Sandusky | .......... | .......... | ....... | .......... | .......... |
| Scioto | 4,849 | 15,013 | 313 | 10,600 | 26,656 |
| Seneca | 11,780 | 25,827 | 52 | 78,645 | 39 994 |
| Shelby | .......... | .......... | ....... | .......... | .......... |
| Stark | 12,385 | 33,490 | 110 | 91,492 | 36,739 |
| Summit | 7,729 | 26,406 | 65 | 68,576 | 14,509 |
| Trumbull | 9,881 | 46,258 | 228 | 85,772 | 9,776 |
| Tuscarawas | 10,501 | 31,420 | 72 | 122,428 | 37,542 |
| Union | 7 928 | 17,528 | 380 | 36 569 | 29,892 |
| Van Wert | 3,919 | 12,181 | 44 | 11,655 | 25,160 |
| Vinton | 3,546 | 11,991 | 222 | 20,545 | 13,009 |
| Warren | 10,672 | 15,767 | 84 | 15,344 | 50,125 |
| Washington | 8,052 | 23,476 | 144 | 39,173 | 23,383 |
| Wayne | 13,039 | 34,693 | 156 | 75,673 | 39,118 |
| Williams | 5,256 | 16,535 | 32 | 23,382 | 23,163 |
| Wood | 6,310 | 20,180 | 101 | 18,194 | 21,316 |
| Wyandot | 6,528 | 17,753 | 183 | 62,238 | 29,083 |
| Totals | .......... | .......... | .......... | .......... | .......... |

## *Sheep.*

| | Killed. | Injured. | Value. |
|---|---|---|---|
| 1858 | 60,536 | 36,441 | $146,758 00 |
| 1859 | 41,979 | 22,750 | 102,398 33 |
| 1860 | 32,781 | 19,001 | 86,795 95 |
| 1861 | 31,750 | 24,254 | 86,434 00 |
| | 167,046 | 102,446 | 422,386 28 |

## LIVE STOCK OF OHIO IN 1861.

*Tabular Statement exhibiting the Number and Value of Domestic Animals, as returned by Township Assessors, and equalized by the County Boards of Equalization, for the year* 1861.

| COUNTIES. | No. Horses. | No. Cattle. | No. Mules. | No. Sheep. | No. Hogs. |
|---|---|---|---|---|---|
| **Adams** | 7,877 | 17,193 | 239 | 17,994 | 40,028 |
| **Allen** | 7,255 | 18 544 | 122 | 24,297 | 23,502 |
| **Ashland** | 8,995 | 21,934 | 44 | 65,664 | 25,342 |
| **Ashtabula** | 9,621 | 42,070 | 77 | 61,799 | 6,666 |
| **Athens** | 6,492 | 17,546 | 53 | 28,883 | 22,172 |
| **Auglaize** | 6,382 | 16,474 | 219 | 17,524 | 28,128 |
| **Belmont** | 11,670 | 23,856 | 90 | 87,483 | 30,583 |
| **Brown** | 10,106 | 17,595 | 231 | 18,010 | 54,344 |
| **Butler** | 12,023 | 16,431 | 226 | 5,135 | 49,992 |
| **Carroll** | 6,316 | 16 448 | 10 | 109,501 | 12,963 |
| **Champaign** | 9,720 | 19,743 | 221 | 35,382 | 33,547 |
| **Clarke** | 9,334 | 18,467 | 334 | 42,141 | 34,599 |
| **Clermont** | 10,457 | 15,389 | 458 | 11,647 | 47,847 |
| **Clinton** | 10,171 | 18,582 | 319 | 33,228 | 56,282 |
| **Columbiana** | 10,222 | 22,915 | 94 | 141,357 | 18,041 |
| **Coshocton** | 9,953 | 25,419 | 21 | 77,073 | 33,002 |
| **Crawford** | 8 924 | 21,292 | 71 | 52,596 | 37,222 |
| **Cuyahoga** | 11,529 | 29,871 | 60 | 49,792 | 10,367 |
| **Darke** | 10,288 | 24,845 | 73 | 16,904 | 49,588 |
| **Defiance** | 4,135 | 12,721 | 29 | 10,954 | 18,795 |
| **Delaware** | 9,360 | 20,981 | 125 | 58,781 | 30,564 |
| **Erie** | 6,111 | 12,600 | 18 | 39,589 | 10,848 |
| **Fairfield** | 12,249 | 34,086 | 100 | 29,216 | 51,201 |
| **Fayette** | 9,345 | 21,402 | 362 | 34,567 | 64,424 |
| **Franklin** | 14,076 | 24,752 | 204 | 19,466 | 67,029 |
| **Fulton** | 4,289 | 15,419 | 23 | 21,013 | 12,164 |
| **Gallia** | 5,727 | 14,908 | 139 | 18,388 | 21,675 |
| **Geauga** | 6,104 | 36,965 | 43 | 41,239 | 4,157 |
| **Greene** | 10,636 | 19,951 | 301 | 21,054 | 56,693 |
| **Guernsey** | 9,045 | 20,528 | 29 | 97,309 | 22,445 |
| **Hamilton** | 16,739 | 18,577 | 534 | 3,901 | 45,188 |
| **Hancock** | 10,532 | 25,457 | 62 | 35,268 | 47,469 |
| **Hardin** | 5,272 | 15,328 | 152 | 17,792 | 29,121 |
| **Harrison** | 6,570 | 14,251 | 31 | 163,548 | 12,106 |
| **Henry** | 2,498 | 7,995 | 23 | 4,385 | 10,110 |
| **Highland** | 12,729 | 22,756 | 315 | 21,550 | 65,244 |
| **Hocking** | 5,578 | 13,497 | 40 | 19,011 | 23,078 |
| **Holmes** | 7,989 | 20,187 | 83 | 49,938 | 22,557 |
| **Huron** | 10,467 | 26,499 | 69 | 88,196 | 21,425 |
| **Jackson** | 4,682 | 16,837 | 114 | 14,362 | 18,655 |
| **Jefferson** | 7,129 | 16,079 | 27 | 131,381 | 14,094 |
| **Knox** | 11,120 | 23,482 | 45 | 93,437 | 32,023 |
| **Lake** | 4,637 | 13,755 | 28 | 35,339 | 3,741 |
| **Lawrence** | 3,258 | 12,082 | 277 | 9,053 | 18,065 |
| **Licking** | 13,655 | 33,107 | 62 | 169,697 | 48,219 |
| **Logan** | 9,238 | 21,120 | 308 | 34,860 | 33,281 |
| **Lorain** | 10,462 | 38,078 | 59 | 90,969 | 13,731 |
| **Lucas** | 3,899 | 9,747 | 19 | 8,957 | 7,813 |
| **Madison** | 7,821 | 22,706 | 287 | 74,873 | 35,439 |
| **Mahoning** | 8,938 | 25,185 | 206 | 90,069 | 12,166 |
| **Marion** | 7,639 | 19,537 | 81 | 60,463 | 37,750 |
| **Medina** | 9,010 | 29,145 | 51 | 98,487 | 13,152 |
| **Meigs** | 4,990 | 13,029 | 127 | 14,054 | 14 836 |
| **Mercer** | 5,705 | 14,837 | 61 | 14,100 | 38,465 |
| **Miami** | 9,587 | 16,738 | 249 | 13,105 | 36,695 |
| **Monroe** | 6 566 | 16,761 | 49 | 19,648 | 16,684 |
| **Montgomery** | 12,064 | 19,198 | 155 | 7,810 | 44,444 |

## LIVE STOCK OF OHIO IN 1861—Continued.

| Counties. | No. Horses. | No. Cattle. | No. Mules. | No. Sheep. | No. Hogs. |
|---|---|---|---|---|---|
| Morgan | 7,771 | 20,940 | 129 | 36,186 | 25,833 |
| Morrow | 9,242 | 23,257 | 56 | 69,468 | 29,919 |
| Muskingum | 13,731 | 35,073 | 69 | 112,421 | 45,394 |
| Noble | 8,137 | 20,714 | 25 | 33,567 | 25,805 |
| Ottawa | 2,371 | 5,807 | 3 | 11,155 | 8,981 |
| Paulding | 1,336 | 5,793 | 3 | 1,863 | 8 111 |
| Perry | 7,475 | 21,484 | 25 | 54,387 | 26,173 |
| Pickaway | 11,419 | 25,445 | 109 | 15,997 | 63,508 |
| Pike | 5,077 | 10,839 | 196 | 13,342 | 32,387 |
| Portage | 8,744 | 38,397 | 62 | 81,465 | 8,119 |
| Preble | 9,538 | 17,065 | 320 | 10,468 | 51,970 |
| Putnam | 4,871 | 15,020 | 29 | 13,086 | 26,712 |
| Richland | 11,066 | 25,171 | 101 | 62,626 | 34,834 |
| Ross | 12,321 | 25,307 | 346 | 19,193 | 76,222 |
| Sandusky | 7,960 | 19,689 | 17 | 28,229 | 29,197 |
| Scioto | 4,646 | 14,348 | 362 | 70,098 | 26,603 |
| Seneca | 11,908 | 24,994 | 41 | 73,081 | 33,604 |
| Shelby | 6,876 | 15,171 | 63 | 18,380 | 30,841 |
| Stark | 13,062 | 33,721 | 87 | 80,040 | 32,967 |
| Summit | 7,736 | 28,132 | 151 | 65,289 | 12,955 |
| Trumbull | 10,492 | 50,539 | 132 | 78,529 | 7,998 |
| Tuscarawas | 11,062 | 31,912 | 45 | 106,679 | 36,196 |
| Union | 7,942 | 16,311 | 197 | 31,619 | 27,252 |
| Van Wert | 3,474 | 10,021 | 34 | 8,466 | 22,018 |
| Vinton | 3,523 | 11,973 | 110 | 17,200 | 14,696 |
| Warren | 10,855 | 16,213 | 109 | 13,644 | 42,640 |
| Washington | 8,059 | 22,500 | 86 | 32,594 | 21,249 |
| Wayne | 13,137 | 35,173 | 161 | 71,848 | 35,706 |
| Williams | 4 961 | 16,159 | 15 | 22,102 | 21,918 |
| Wood | 5,786 | 18,204 | 61 | 14,268 | 17,833 |
| Wyandot | 6,598 | 17,777 | 162 | 54,007 | 28,417 |
| Totals | 738,427 | 1,837,938 | 11,155 | 3,943,436 | 2,595,981 |

| | |
|---|---|
| Value of Horses | $36,211,355 |
| " Cattle | 19,734,330 |
| " Mules | 601,479 |
| " Sheep | 6,681,427 |
| " Hogs | 7,235,277 |

## *Number and Value of Horses.*

| Year. | Number. | Value. |
|---|---:|---:|
| 1826 | 121,956 | $4,878,240 |
| 1830 | 173,191 | 7,103,840 |
| 1836 | 268,662 | 10,746,480 |
| 1840 | 334,112 | 13,364,460 |
| 1846 | 475,788 | 15,005,263 |
| 1848 | 492,509 | 16,856,841 |
| 1850 | 513,652 | 19,142,789 |
| 1851 | 517,396 | 20,337,442 |
| 1852 | 402,695 | 16,863,796 |
| 1853 | 615,085 | 27,844,619 |
| 1854 | 632,598 | 32,512,988 |
| 1855 | 624,746 | 31,415,004 |
| 1856 | 621,443 | 36,231,127 |
| 1857 | 630,659 | 39,409,890 |
| 1858 | 655,754 | 38,450,896 |
| 1859 | 692,503 | 38,698,178 |
| 1860 | 709,713 | 37,660,141 |
| 1861 | 738,427 | 36,211,355 |

## *Number and Value of Cattle.*

| Year. | Number. | Value. |
|---|---:|---:|
| 1826 | 253,544 | $2,028,352 |
| 1830 | 356,728 | 2,853,824 |
| 1836 | 372,866 | 2,982,928 |
| 1840 | 546,884 | 4,375,504 |
| 1846 | 920,995 | 7,572,123 |
| 1848 | 983,822 | 9,729,929 |
| 1850 | 1,103,811 | 11 315,560 |
| 1851 | 1,116,145 | 11,382,950 |
| 1852 | 1,093,218 | 10 097,858 |
| 1853 | 1,646,195 | 17,646,810 |
| 1854 | 1,772,667 | 20,995,680 |
| 1855 | 1,791,189 | 18,902,006 |
| 1856 | 1,687,710 | 21,175,070 |
| 1857 | 1,655,415 | 21,662,223 |
| 1858 | 1,718,640 | 20,836,979 |
| 1859 | 1,802,872 | 21,416,572 |
| 1860 | 1,779,061 | 20 385,966 |
| 1861 | 1,837,938 | 19,734,330 |

### *Number and Value of Sheep.*

| Year. | Number. | Value. |
|---|---|---|
| 1846 | 3,141,946 | $1,758,433 |
| 1848 | 3,677,171 | 1,988,316 |
| 1850 | 3,812,767 | 1,984,983 |
| 1851 | 3,619 674 | 2,060,012 |
| 1852 | 3,059,796 | 3,581,385 |
| 1853 | 4,104,450 | 6,448,391 |
| 1854 | 4,845,189 | 8,031,854 |
| 1855 | 4,337,943 | 5,664,829 |
| 1856 | 3,513,680 | 5,009,410 |
| 1857 | 3,276,539 | 5 357,275 |
| 1858 | 3,377,840 | 4,755,215 |
| 1859 | 3,366,073 | 5,442,984 |
| 1860 | 3,442,856 | 5,879,357 |
| 1861 | 3,943,436 | 6,681,427 |

### *Number and Value of Hogs.*

| Year. | Number. | Value. |
|---|---|---|
| 1846 | 1,405,094 | $2,238,876 |
| 1848 | 1,879,689 | 2,341,106 |
| 1850 | 1,672,178 | 1,902,029 |
| 1851 | 1,450,643 | 2,297,229 |
| 1852 | 1,299,746 | 3,081,981 |
| 1853 | 2,498,792 | 5,624,790 |
| 1854 | 2,887,015 | 5,558,487 |
| 1855 | 2,195,769 | 3,531,562 |
| 1856 | 1,851,124 | 5,268,008 |
| 1857 | 2,331,778 | 6,772,470 |
| 1858 | 2,541,904 | 6,191,373 |
| 1859 | 2,242,812 | 4,747,526 |
| 1860 | 1,918,225 | 5,121,286 |
| 1861 | 2,595,981 | 7,235,277 |

# ESSAYS

AND

# REPORTS OF COUNTY SOCIETIES,

## FOR THE YEAR 1861.

# PROCEEDINGS

OF THE

# STATE BOARD OF AGRICULTURE FOR 1861.

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STATE AGRICULTURAL ROOMS,
*Wednesday Evening, Dec.* 5, 1860.

Present—Messrs. Millikin, Trimble, Reber, Townshend, Potwin, Jones, DeWitt, Perkins, Taylor and Gardner.

Proceeded to elect the following officers:

Darwin E. Gardner, *President;* C. W. Potwin, *Treasurer;* Wm. DeWitt, *Recording Secretary;* J. H. Klippart, *Corresponding Secretary.*

*Voted,* That when we adjourn it be to February 6, 1861.

*Voted,* That Mr. Klippart advertise for propositions from cities desiring the next State Fair, and that the sum required will be $5,000, and grounds furnished, together with the usual railroad facilities.

*Voted,* That a committee of three, consisting of Messrs. Jones, Millikin and Townshend, revise the premium list and report at the February meeting of the Board.

*Voted,* That the volume of Agricultural Report for the year 1860 shall be of such form and contain such matter as the President of the Board for that year and Corresponding Secretary shall direct.

*Voted,* That the essays sent in to the Board be referred to Messrs. Townshend and Perkins.

*Voted,* That we adjourn.

WM. DEWITT, *Recording Sec'y.*

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STATE AGRICULTURAL ROOMS,
*February* 6, 1861.

Board met according to previous notice. Members all present.

Messrs. Hubbell and Gillis presented the claims of Dayton for the Fair of 1861, urging that the fixtures were all on the grounds, and the grounds in good order.

They pledged that a good and sufficient bond for $5,000 should be forthcoming at such time as the Board shall designate.

Mr. David Taylor presented the claims of Columbus, and pledged the usual bond of $5,000, and free use of grounds.

Mr. Wm. DeWitt presented the claims of Cleveland, and pledged the usual bond of $5,000, and free use of grounds.

On motion it was

*Resolved*, That the State Fair of 1861 be held on the same grounds on which it was held in 1860, provided the citizens of Dayton present a bond guaranteeing the payment of $5,000 to the satisfaction of Messrs. T. C. Jones and O. W. Potwin on or before the 22d day of February, 1861; and provided further, that they secure the use of the grounds on which the Fair of 1860 was held free of charge to the Board, and secure the usual railroad facilities.

On motion it was

*Resolved*, That if Dayton fails to comply with the above requirements, then the Board will proceed to hold the Fair in the city of Cleveland on the terms offered by that city.

On motion,

*Resolved*, That the sum of two hundred dollars be allowed for clerk hire for the remainder of the current year.

On motion,

*Resolved*, That the late President be authorized to examine the articles intended for the Report of 1860, and approve or reject as in his judgment may seem best.

On motion it was

*Ordered*, That the Corresponding Secretary re-arrange the rules and regulations of the State Fair, so as to have the paragraphs more consistent with each other in their order of succession.

On motion,

*Voted*, That the following premiums be offereed:

| | |
|---|---|
| Best saddle stallion | $20 |
| Second best saddle stallion | 10 |
| Best stallion of any age or breed | 100 |
| " mare " " | 100 |

### SWEEPSTAKES.

| | |
|---|---|
| Best herd of one bull and four cows, to be of one breed and owned by exhibiter | $100 |
| Second best herd of one bull and four cows, to be of one breed and owned by exhibiter | 50 |
| Best breeding bull with five of his calves not less than one year old, and the bull as to constitution, health and vigor to exhibit good breeding condition | 60 |

Second best breeding bull with five of his calves not less than one year old and the bull, as to constitution, health and vigor, to exhibit good breeding condition ........................................................

*Voted*, That premiums be offered on Silesian sheep the same as on Saxony and Merinoes.

*Voted*, That the following premiums be offered:

| | |
|---|---|
| Best boar of any age or breed ........................................ | $20 |
| Best sow of any age or breed........................................ | 20 |

*Voted*, That a second premium of $2 be offered on all kinds of fowls now on the list.

*Voted*, That a premium of $3 be offered for embroidery stamping machine.

*Voted*, That the Fair be held on the 10th, 11th, 12th and 13th days of September, 1861.

*Voted*, That Mr. Reber be authorized to purchase the American Turf Register at a price not to exceed $100.

On motion, adjourned to meet at State Agricultural Rooms on the first of May next.

WM. DeWITT, *Recording Sec'y.*

Attest: J. H. Klippart, *Corresponding Sec'y.*

State Agricultural Rooms,
*May 1st*, 1861.

Members all present. President Gardner called the Board to order, and stated that, in consequence of the war, some parties advised the postponement of the Fair until another year, but, for his part, he entertained no fears that the Fair would not be as successful this year as in former ones; especially as we would not be at any expense for fixtures or structures.

An informal vote was taken, and it was decided to hold the Fair. The Board then proceeded to nominate committee-men for the various committees.

*Voted*, That the Corresponding Secretary be authorized to contract with Denny and Son, of Dayton, for the printing of 12,000 copies of the premium list, at a rate not to exceed $215; that Denny and Son accept an order for the payment of the same on citizens of Dayton who have subscribed to the Fair fund.

*Voted*, That the Corresponding Secretary be authorized to contract with Fairbanks, Benedict & Co., of Cleveland, for the printing of 1,500 posters, at a rate not exceeding $175.

On motion, voted that Philander Gregg be employed to make such repairs to the grounds as the executive committee shall deem expedient.

On motion, adjourned to meet in Dayton the 7th of September next.

WM. DeWITT, *Rec. Sec.*

Attest: J. H Klippart, *Cor. Sec.*

PHILLIPS HOUSE, *Dayton, Aug* —, 1861.

At a meeting of the Executive Committee, held at the Phillips House, Dayton —present Messrs. Gardner, Millikin and Klippart—the following persons were appointed marshals:

P. Gregg, Chief Marshal and Chief of Police; A. Houck, Hiram Harris, W. B. Johnston.

The Secretary was requested to address a letter to each of the members of the Board, soliciting them to appoint a superintendent and assistant superintendent of their several departments.

The following persons were appointed superintendents:

Cattle, Horses and Sheep—J. M. Millikin, (J. P. Wilson appointed.)

Hogs, Poultry, Manufacturers' Hall, Mechanics' Hall and Power Hall—Jonah Bull, Dayton.

Floral Hall—Wm. Heaver, Cincinnati.

Fruit Department—John Kirkpatrick, Cleveland.

Fine Art Hall—F. W. Cridland—Dayton.

The Dining Hall was leased to N. Ohmer for $500—he agreeing to subsist such parties as the Board should direct for 30 cents per meal.

J. H. KLIPPART, *Cor. Sec.*

DAYTON, *September* 13*th*, 1861.

At a meeting of the Board it was

*Ordered*, That twenty dollars be paid to Jacob Morrison for use of way through grounds and damage to the same, in full for his claim.

*Ordered*, That Mr. Millikin advertise for proposals for the sale of lumber connected with the State Fair grounds belonging to the Board.

*Ordered*, To pay Mr. Jackson ten dollars for what hay he had upon the ground; also, to pay him twenty-five dollars for services during the year in taking care of Fair grounds.

*Ordered*, That the commended premium of Mr. Williams for Cashmere goats be deferred until the winter meeting of the Board.

WM. DEWITT, *Rec. Sec.*

## PROCEEDINGS OF THE STATE BOARD.

STATE AGRICULTURAL ROOMS,
*Columbus, O.*, Jan. 6, 1862.

Present: Darwin E. Gardner, *President;* Wm. De Witt, *Rec. Secretary;* T. C Jones, N. S. Townshend, David Taylor, Jno. M. Millikin, Jno. Reber, and H. B. Perkins. Absent, C. W. Potwin and J. M. Trimble.

MONDAY EVENING, Jan. 6, 1862.

President Gardner, in the chair, called the meeting to order, and stated that owing to the absence of Mr. Potwin, an examination of the Treasurer's, Secretary's, and Executive Committee's accounts could not be had, but that there were sufficient data in the hands of the Secretary to give an approximate statement of the condition of the Treasury.

The Secretary presented a letter from Wm. Hageler, in which the writer claims a premium of $20, which was awarded on one of his horses at the Dayton Fair in 1860, but which had been paid to Wm. Bain. It appears that Mr. Hageler commissioned a Mr. Alexander to exhibit his (Hageler's) horses at that Fair, but Mr. Alexander intrusted the matter of making entries to Mr Bain. The Secretary made the entries as requested by Mr. Bain, and regarded him as the agent; and when the Fair was concluded, Bain demanded the premium, which was accordingly paid to him. The Board decided that the conduct of the Secretary was proper, and that Mr. Hageler must obtain the money from Mr. Bain.

The Secretary then presented a list of commended articles at the last State Fair.

On motion, it was voted that the commended list be referred to Jno. M. Millikin, to report what articles were entitled to awards. The report is as follows:

| | |
|---|---|
| L. S. Fairchild, Cleveland, Water-wheel | Diploma |
| Prinz & Kuhns, Dayton, Horse Power | “ |
| F. F. Fowler, Upper Sandusky, Hay Gatherer | “ |
| Do “ Hay Pitching Machine | $3 |
| Jno. G. Henderson, Upper Sandusky, Farmers' Loom | Diploma |
| Landon Rood, Elyria, Portable Force Pump | “ |
| Miss E. H. Jenkins, Dayton, Fig-tree | $1 |
| S. S Williams, Granville, Cashmere Goats | Diploma and $25 |
| Thompson, McGregor & Co., Dayton, Display of Castings | Diploma |
| G. Collins, Dayton, Newell Posts and Balustrades | “ |
| John Tittle, Dayton, Calf and Kip Skins | “ |
| W. Helfrick & Bro , Dayton, Horse Collars | “ |

At the late Fair, the first premium on aged Ewes was awarded to Wm. Eagleson, but the Committee made no record on the book; also the premium on Lambs to John Singer.

*Voted,* That Messrs. Singer and Eagleson be paid the premiums so awarded.

Prof. M. A. Mot presented some papers on Beets and Sorgho, with specimens, which were referred to a committee consisting of Messrs. Townshend and Jones.

The only application, in accordance with the Rules and Regulations for Premiums on Field Crops, was made by Gurdin Perrin, of Erie county, for one acre of buckwheat, $10. Mr. Perrin raised 189½ bushels of potatoes on half acre, but the Rules and Regulations require 200 bushels; therefore no premium was awarded, though the requirements were filled in every other respect.

The committee on Prof. Mot's application reported as follows:

The committee to whom was referred the specimens of beet sugar, exhibited in competition for the premiums offered by the State Board of Agriculture, for the best conducted and most valuable experiments in the manufacture of sugar and syrup from any plant adapted to this State, would respectfully report, that the committee do not regard the experiments of Prof. Mot as sufficiently extensive to warrant the advertised award of $50; yet in view of the interesting character of his investigations and experiments, the committee recommend that the sum of $20 be presented to Prof. Mot.

[Prof. Mot is the first one who has succeeded in obtaining a good article of crystallized sugar from the beet root in the United States.—KLIPPART.]

On motion, adjourned to meet to-morrow morning at 9 o'clock.

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TUESDAY, January 7, 1862.

Board met and held an informal session, after having visited the Sorghum Convention. Among other proceedings, Mr. Day, of Mansfield, exhibited some half dozen beautiful samples of Sorgho sugar, and requested the Board to decide which was the best. It appears that Mr. Day offered a copper evaporator as a premium, to be awarded by the State Board, for the best sample of Sorgho sugar, not less than 20 pounds; the award was made to Mr. Cook, of Mansfield. In the evening another informal session was held.

Prof. A. Mot, of Columbus, submitted the following paper concerning the practicability and economy of making sugar from the beet root in Ohio:

*To the Ohio State Board of Agriculture:*

The subscriber begs leave to submit the following remarks:—

The State of Ohio could raise her own sugar and export a surplus, notwithstanding failures in former attempts.

Scepticism is the main obstacle in the way; to remove this, nothing will avail except a successful, practical, *public* demonstration, on a large scale; this ought to be encouraged.

The consequences of beet cultivation are—

1st. To increase from *one* to *ten*, the number of horses, cattle, and sheep.

2d. To supply the land with immense quantities of phosphate (bone-black) and other residues, all favorable to wheat.

3d. To relieve a State from sugar importation.

4th. To give expansion to metallurgy and machine shops, by the demand for new implements.

5th. To introduce a profitable industry in which all branches of natural sciences find application.

It has been affirmed that $60,000,000 could be added to the annual production of the State, by substituting beets for corn on 300,000 acres; this could be done in less than ten years.

To reach this desideratum, France applied energetic means; in the midst of *general war* she offered a premium of $200,000. Beet-sugar was *immediately* taxed, and has been so ever since; this tax, now *reduced* to 2½ cents per lb., yields $6,097,070 for beet-sugar alone, and probably $2,000,000 for molasses.

The declining fertility of the soil in Ohio, and the pressure of the times, call for decisive action; therefore the subscriber respectfully suggests that the State authorities be requested to offer a premium (liberal and commensurate with the interests at stake), to be awarded "to the first person having planted within the State no less than five acres of beets, and having made therefrom no less than 5000 pounds of fair, merchantable, crystallized brown sugar."

Will those having charge of the commonwealth apply the proper means, or shall another State have the advantages of present opportunities?

In competition for the premium which is offered for the most valuable experiment on sugar and syrup, the subscriber respectfully submits his specimens and the detail of his operations:

The most valuable experiment is that which opens the way to the greatest profit. The included extract from the *Field Notes* demonstrates the "importance" of beet sugar, and the possibility of its profitable production in Ohio.

The seeds for the subscriber's experiments during the last four years, were mostly supplied by the obliging Secretary of your Board.

The calculated production of beets averaged 30 tons to the acre; a parcel of seeds planted in the garden of G. M. Parsons, Esq., of Columbus, yielded at the rate of 65 tons to the acre; a specimen of this crop is herewith submitted, with the offer to make sugar therefrom in presence of the Board.

Experiments in making sugar were more or less successful, according to the kind of beets; the white French beet gave the best results; the per centage was low, owing to the want of implements; it was in average 4 parts of sugar and 6 parts of molasses on 100 parts of beets.

The specimens are:

No. 1. Raw beet sugar in progress of crystallization; the dark color belongs to the molasses; this being removed, the crystals will appear with a light brown color, similar to No. 3.

No. 2. Beet molasses drained from specimen No 3, and filtered through French woolen stuff of the adjoined pattern.

No. 3. Brown beet sugar extracted from white French beet, raised near Newark (Cherry Valley), Licking county; seeds from the Board of Agriculture.

No. 4 Clayed beet sugar partly refined, from white French beet, raised in the garden of G. M. Parsons, Esq., at Columbus, Ohio. The refining operation could not be perfected for want of machinery.

No. 5 Sorgho syrup from the half of one cane; it contains neither gluten, acid or essential oil; it will not ferment; process as usual, except removing the rind of the cane, and filtering with bone-black and woolen stuff. With a large evaporator, a golden color or even white may be obtained.

The detail of the operations was:

| | *How it is done in Factories.* |
|---|---|
| 1. Washing the beets by hand. | By a washing machine. |
| 2. Rasping the beets with a tin grater. | By a rasping machine. |
| 3. Pressing the pulp in a cloth. | By a hydraulic press. |
| 4. Heating the juice to 85° C., then adding 1 per 100 of lime, diluted; heating to 100° C., then allowing rest to complete defecation. | In large kettles. |
| 5. Filtering the juice with bone black. | In coarse filter |
| 6. Boiling juice down to 24° B. | In large evaporator. |
| 7. Filtering syrup with bone-black. | In fine filter. |
| 8. Cooking syrup to 45° B. | In vacuum pans. |
| 9. Cooling the sugar in a cup. | In a vat. |
| 10. Placing sugar to crystallize. | In cones in hot-house. |
| 11. Draining off the molasses. | From the cones " |
| 12. Drying the sugar before the fire, and packing. | By steam " |

The subscriber claims no merit of invention, his "modus operandi" being the reproduction (on a small scale) of that which he had occasion to observe in the factories of Europe.

A. MOT.

## STATE AGRICULTURAL CONVENTION.

Official Report for the Ohio State Board of Agriculture, by Elias Longley.

Senate Chamber, Columbus, O.,
January 8, 1862.

President D. E. Gardner took the chair, and remarked: Gentlemen of the Convention—We have met here to-day, as has been our custom for many years, to reorganize the State Board of Agriculture, and hear reports of the proceedings of the past year, and receive such suggestions as to the conduct of our affairs for the year to come, as may be submitted.

Proceeding in the usual order, I shall call over the counties, and trust that the delegates or presidents will present their credentials to the Secretary, in the order in which they are called.

| | |
|---|---|
| Allen | Isaiah S. Pillary. |
| Ashland | Thos. Bushnell,<br>W. B. McCarty. |
| Ashtabula | Abel Krum. |
| Athens | H. T. Brown. |
| Brown | P. L. Wilson. |
| Butler | Fergus Anderson. |
| Carroll | Leonard Harsh. |

| | |
|---|---|
| Champaign | T. K. Thompson. |
| Clarke | William Hunt. |
| Clermont | John Kugler. |
| Clinton | B. W. Fuller. |
| Coshocton | James M Burt. |
| Crawford | O. D. Ward. |
| Cuyahoga | A. A. Jewett. |
| Darke | J. S. Winner. |
| Delaware | T. F. Joy. |
| Fairfield | J. A. Fetters. |
| Fayette | G. Terrill. |
| Franklin | J. Forsman. |
| Geauga | Peter Hitchcock. |
| Greene | Daniel McMillen, Jr. |
| Guernsey | Thomas Oldham. |
| Hancock | D. B. Beardsley. |
| Hardin | John H. Elder. |
| Hocking | J. M. Floyd. |
| Huron | J. D. Easton. |
| Jackson | Isaac Roberts. |
| Jefferson | Robert Sherrard, Jr. |
| Knox | J. M. Byers. |
| Lake | Selick Warren. |
| Licking | W. C. Maholm. |
| Logan | George Folsom. |
| Lorain | N. B. Gates. |
| Lucas | James Myers. |
| Madison | H. Toland. |
| Mahoning | R. M. Montgomery. |
| Marion | E. Peters. |
| Medina | J. Seely. |
| Troy | W. B. McLung. |
| Montgomery | Jefferson Patterson. |
| Morgan | W. P. Sprague. |
| Morrow | G. W. Hiskitt. |
| Muskingum | V. Best. |
| Noble | Canfield Phelps. |
| Pickaway | G. W. Gregg. |
| Portage | Thomas Gorby. |
| Preble | G. W. Dooly. |
| Putnam | John Maidlaw. |
| Richland | B. S. Runyon. |
| Sandusky | Daniel Capper. |
| Seneca | Lewis Baltzell. |

| | |
|---|---|
| Shelby | Isaac Fulton. |
| Stark | Samuel Lind. |
| Summit | P. C. Carothers. |
| Trumbull | Josiah Robbins. |
| Tuscarawas | John Hills, Jr. |
| Union | R. D. Reed. |
| Warren | Jacob Egbert. |
| Washington | George Dana, Jr. |
| Wayne | R. R. Donnelly. |
| Williams | P. W. Norris. |

When Jefferson county was called, Robert Sherrard, Jr., responded : I hold in my hand authority from the Board of Agriculture in Jefferson county, to appear in this Convention for them. But I am not a member of that Board, and desire to know whether I may act for that body.

Chair. The gentleman will pass his credentials to the Secretary, and they will be decided upon in a proper manner.

Two delegates, Messrs. W. B. McCarty and Thomas Bushnell, appeared from Ashland county.

On motion of Mr. Hitchcock, a committee of five on credentials was appointed, consisting of Messrs. Hitchcock, Gates, McMillen, Anderson and Norris.

Mr. Townshend moved that gentlemen who have propositions or resolutions to present to the Convention, be requested to do so now, and that they be laid on the table, so that after getting our work before us, we can apportion our time to better advantage than if left without preparation. Carried.

The following resolutions were then offered :

By Mr. McClung. *Resolved,* That in the opinion of this Convention, the law changing the time of the annual meeting of delegates to the State Board of Agriculture from the first Wednesday after the first Monday in December, to the first Wednesday after the first Monday in January, will prove injurious to the agricultural interest of the State; and in view thereof, we respectfully ask the Legislature to repeal the law of 1861 upon that subject, and re-enact the law requiring them to meet on the first Wednesday after the first Monday in December.

By Mr. Easton. *Resolved,* At the annual meeting of the Huron County Agricultural Society, that the State Society be requested to pass a resolution asking the Legislature to pass a law prohibiting horses, cattle, hogs and sheep from running at large on the highways of the State; and that the lands of this State in highways be remitted from taxation.

By Jas. M. Burt. *Resolved,* That the Legislature be petitioned to fix by law a day for the election of officers of County Agricultural Societies, and also days for regular meetings of County Boards for the transaction of business.

By T. F. Joy. *Resolved,* That this convention memorialize the General Assembly of the State to enact a law requiring railroad companies to fence their respective roads.

*Resolved, further,* That a committee of three be appointed by the President of this Convention to prepare and present such memorial, together with these resolutions, and to confer with the proper committee of the two Houses on the subject.

Mr Millikin suggested that as one of the objects of the Convention was to fill the Board with five new members, opportunity be now given for nominations.

Mr. Sherrard objected; that until the committee reported on the credentials of delegates, it would be improper to make nominations.

It was agreed that the names of candidates might be mentioned for consideration; whereupon the following nominations were made:

H. P. Cannon, Summit; B. S. Runyon, Richland; Geo. McCullough, Jefferson; J. M Glover, Logan; N. J. Turney, Pickaway; M. M. Munson, Licking; Wm. Taggart, Wayne; H B. Perkins, Trumbull; T. C. Jones, Delaware; Wm. R. Putnam, Washington; Jacob Egbert, Warren; N. S. Townshend, Lorain; John Reber, Fairfield; W. B. McClung, Miami; J. Gill, Crawford; A. E. Strickle, Clinton.

The Chair remarked that Mr. Trimble was very unexpectedly detained from the meeting of the Board; and, while he is as much interested in the subject of agriculture as ever, he declines a re-election.

On motion, the Secretary was authorized to have tickets printed for the use of delegates, containing all the names of candidates to fill the vacancies in the Board.

A call was made for a report from the Treasurer.

Chair—The Treasurer, Mr. Potwin, on account of sickness in his family, will not be here; but his report will be audited and presented.

Since I have been connected with the Society, its affairs have never been in as good condition as now. There are over $3,000 in the treasury, we are out of debt, which we have not been at any period since my connection with it, and every circumstance is favorable to prosperity, which in these trying times we would hardly have expected. The retiring Board thus leaves the Society in a better condition than when they assumed their duties.

As the expenditures of the Board have been made at different times, by different persons, and at different places, the accounts cannot be rendered by one officer; it is necessary to bring all the accounts together, to make a full exhibit; and it is on account of the unexpected absence of the Treasurer that a report is not ready. It will be presented as soon as possible.

On motion of Mr. Millikin, the resolution of Mr Burt, in regard to changing the time of the election of officers of Agricultural Societies, was taken from the table.

Mr. Burt. My object in presenting this resolution is to secure a more general attendance at the election of officers Our meetings for such purpose have been slimly attended; and as there is no law specifying the person whose duty it is to give notice of this election, it is generally done by two or three members of the Board who happen to meet in the town, and it is not generally diffused. For several years we held the election on the last day of the Fair, but we found that would not do, for the Board, to manage the business successfully, should remain in office till the business of the year be settled up. The change of officers on the last day of the Fair created confusion; and since that, when it has been left with officers to give notice, the attendance has been unsatisfactory. I think the first Monday in March would be an appropriate day for the transaction of township business; and some day in August for attending to the business preceding the Fair. If the Legislature would appoint by law a day for each of these purposes, we would soon know it, and would hardly ever hear of Presidents forgetting the first Monday in March, to meet and settle accounts.

Mr. McClung. I don't know where it is, but it strikes me there is a law requiring Agricultural Societies to be governed by the State Board of Agriculture. I see in our Agricultural Report a rule covering this resolution. In the 4th section, in regard to the election of officers, I read:

IV. The election of officers for each county or district society shall be held in each year at such a time in January as the county or district society may determine upon.

In accordance with this rule, our Society has acted heretofore. It strikes me that, without any act of the Legislature, that can be reached by the Board. If this is not specific enough, the Board, under the law, could do this thing better than by the Legislature. I would say also that the less we ask of the Legislature the more we will get granted.

Mr. Burt. If the gentleman sees fit he may strike out "Legislature," and insert "State Board."

Mr. Clung moved to amend the resolution by requesting the Board to specify a day in January on which elections shall be held. Amendment accepted.

Mr. Easton moved to amend by inserting the second Tuesday after the first day in January. The Presidents of Societies should be permitted to close up the business of Societies for the preceding year, before the election of new officers.

Mr. Krum. I am pretty well satisfied that the practice of County Societies has not been uniform. I think in many cases the Societies have elected officers sometime during the fall Fair. If any difficulty should arise, it would be a serious question whether the officers elected at such times have any authority. If that be the case—if elections have been held at times different from that prescribed by rule of State Board—if the action of the Board cannot secure that defect—I think it important that some legislation should be had. In case a controversy should arise as to the authority of these officers, it is a question whether they are legally authorized to represent their Societies, and it is a question if this State Board have the authority to cure this defect.

Mr. Jones. Query—Why not say the second Tuesday in January? I am inclined to believe that it will be better that the delegates should be the old members.

Mr. Easton. We used to hold our annual meetings on the second Wednesday after our annual Fair in October Then we changed it to the second Tuesday after the first day in January. The Legislature changed the time of meeting of the Board, and it was deemed best by our Society that the President should finish up the business of the year, therefore I appear as a delegate from our Society. I think it will be better to have the elections so that the officers can finish up all the business of the previous year.

Mr. Jones. I would say the third Tuesday in January.

Mr. Easton. I accept the third Tuesday.

Mr. Millikin. I submit whether further legislation is necessary. The State Board has adopted a rule, saying these elections shall be held in January. Is it necessary they should be specific to a day? There may be circumstances requiring that some Societies should have their elections a week earlier or a week later It is said the elections should take place after this Convention. The rule is sufficient to enable Societies to hold their elections after it; still, there is opportunity for discretion on the part of Societies as to the day. There might be other proceedings that might make it inconvenient to hold their elections on a certain day.

There is another branch of the resolution to which I am opposed. That is, it asks the Legislature, or State Board, to fix a day for the annual meeting of County Societies. That is a matter that should be under their own control The object of uniformity is sufficiently attained by saying they shall be held in January.

Mr. Burt. I would ask how many delegates are elected under this rule?

Mr. Joy. I should be decidedly opposed to any such rule. Our county has not followed it. The practice is to hold the election on the first Wednesday after the exhibition; the matter is then fresh in the minds of farmers, and we generally have a good turnout. January is a bad month in which to meet, on account of the usual bad roads.

Mr. Byers offered an amendment that the Board be directed to fix the day, say on the second Tuesday or Saturday of November. I cannot see any good results of fixing the meetings in January. Certainly it would be desirable to have all the reports come in together; and the probability is, that unless the time of meeting is had at such time as the different Societies can make up their reports in full, including the election of officers, the reports will be coming in at all times of the year, and at the annual meeting we would be short of reports. This thing of agriculture is like many other things: it has its seasons of interest, and the attention of farmers is generally called to it at the County Fair, and that time would be more likely to call out a good attendance. I think you will not find a dozen delegates here who were elected according to the rule. I know ours is not. We have always held our meetings in November.

Mr. Jones. My experience in regard to the matter is this: The fair is held in October, and time is given till January for persons to call for their premiums; if not called for by that time, they revert to the Society. It has so happened that the whole Board was obliged to go out before it could close up the affairs of the year. It is impossible we should know the state of finances until the premiums are called for, and we cannot have a full report till after that time has expired.

Mr. Joy. So far as my experience goes, we have had no trouble of that kind. Our members hold their seats till the first of January. Then we have in our by-laws a rule to this effect: "All premiums not called for before the first of January, will be considered donated to the Society."

Mr. McClung. My experience has been, that where we have held the election directly after the fair, everything was at the top, and everybody interested; when cold weather comes on, the interest is lost, and those having only a temporary interest in agriculture would not be as likely to come together. It strikes me that it is better to put the election at a time when those who are in earnest will come together. Men who are deeply interested will come together in January as readily as at any time. And men will come out in bad weather, when they could not do anything else; they will be more ready to come tegether then than when husking corn, or doing other necessary work.

Mr. Hunt moved to lay the resolution on the table. Carried.

On motion, the resolution of the delegate from Miami, asking the Legislature to repeal the law changing the time of meeting of this Convention, was taken up.

Mr. McClung. I introduced this resolution for the purpose of calling out the different opinions of gentlemen on the question. It was before the Legislature last winter, and I with others opposed the change. I did it upon the ground that the agricultural interest of Ohio is of sufficient importance to stand entirely alone, independent of political, religious, or any other organization, it being the leading interest of the State. The special purpose of calling these delegates together is, that they should come up and deliberate on the agricultural interests of the State —give their experience. In my opinion, I think such deliberation will not be had at the time we are now assembled. We are here at the meeting of the Legislature, when nothing is fixed; the interest and noise and confusion connected with the organization of that body prevent our attending to the agricultural interest as it ought to be attended to.

Another thing is, that we should keep this agricultural interest separate from any other interest. I do not say that members of the Legislature are not as good delegates as others; but they are often delegated, not because they are agriculturists, but because they are coming to Columbus. I am in favor of sending up practical agriculturists, whose business it is to cultivate the soil, and have them give us their experience; and when it is given, that they request the Legislature to enact laws to promote the agricultural interest of the State. As it is now, those of us who are members of the Legislature will be sitting upon our own action. We go into the Assembly and sit upon our own resolutions. We should be entirely disconnected. With the influence of men here connected with the Legislature, the election of our Board can be controlled. This should not be.

I think there is no one object so desirable as to have our agricultural interest stand up full and prominent as an interest of the State, and in that way bring out our agriculturists before the community. It is a matter of fact that not till recently, and not even now, has the agriculturist taken that position he ought to maintain; and we should endeavor to make his business recognized as the leading interest of the State, not dependent on any other body's meeting. It was changed to this time, that we might have a better meeting; but I think we will find out that this is a mistake; we will find out that we have not as many in attendance as before. For this reason I am in favor of the law being as before, fixing the meeting on the first Tuesday after the first Monday in December.

Mr. Millikin. One of the reasons for the change was, that the members of the Legislature come here on railroad passes, while members of the Board pay for coming here. But early in January no passes are issued, and the consequence is the additional expense of the State Board will be from $100 to $150.

Mr. Krum. I have been somewhat acquainted with the meetings of this Convention, and I must say that I have never seen so small a meeting as this; and I apprehend that were we to inquire to-day, we should find more persons absent who are appointed than ever. The reason for changing the time was, that members might see the glorious Legislature of Ohio in session. They come here to-day, and find the Legislature celebrating the 8th of January, and delegates who have been appointed to attend this meeting, are attending somewhere else. I fear this will always be so. I was opposed to the change of time; the thing had worked well, and I was satisfied to let it continue to work well. If this body has any influence, I hope it will exert it to restore the law to its original shape.

The question was now put, and the resolution adopted.

Mr. Millikin moved that John A. Warder, a member of the Cincinnati Horticultural Society, be admitted to the deliberations of this Convention; and, if he please, that he address it on the subject of Sorghum.

The motion carried unanimously, and Dr. Warder addressed the meeting in the following off hand manner:

Mr. President: I highly appreciate the honor conferred by this invitation, and I can only say I am unworthy of it.

I learned a lesson early in life, which has been of some use to me, but I have not profited by it as much as I should have done. I learned it from a venerable grandfather, who used to tell me—"John, when you have anything to say, say it and be done with it." Now I don't come here to make a speech. My natural proclivities are pomological, and I have seen gentlemen who are present set beautifully on apples. That would be the strike I would incline to very much; but as my friends incline to be sweet, and as I have recently occupied a position on the sugar question, I will make a few remarks on the subject. It is one which claims a great deal of attention from the people of Ohio.

I am informed on second-hand authority—for I am not a commercial man, but those engaged in commerce, who know what is what—that we have in the city of Cincinnati, the great *entrepot* of Louisiana, ninety days' worth of molasses. Ninety days will revolve in the course of three months, and what are we to do for sweetening? Spring will start the sap in our maple trees, and we shall probably get some syrup from that source, but it will but be a drop in the bucket. Here is a condition of things that requires our consideration. It is to the interest of the people of Ohio to look into this matter of Sorghum, and say whether it is worth while to manufacture our own molasses and sugar.

If this supply of Louisiana syrup fall short, we have an extra inducement to cultivate the cane, and make our own. When Sorghum was first introduced, I was one who planted the first distribution of seed from the Patent Office. Not being a sugar-maker—knowing nothing about it, and, I am ashamed to say, not wanting to know—I looked around, and drew this conclusion, and the facts before me are verifying the prophecy: Syrup may be made from Sorghum, but it requires more experiment, and more chemical knowledge to produce a merchantable sugar, than we yet possess. Here are two kinds of sugar—crystallizable and non-crystallizable sugar; and when I put my spoon into the sugar bowl I want to take from the crystallizable article. It remains to be proved whether this particular element, or that, will produce this or that. A great deal will depend on the manufacturer. The prophecy was, this Sorghum will produce uncrystallizable sugar, but whether we can get the crystallized article remains to be proved.

From the samples exhibited before us yesterday, at the Sorghum Convention, we had beautiful specimens of crystallizable sugar, and it is now rendered patent that such sugar can be produced. It is not produced in merchantable quantities, but if it has been done, it may be done to any extent.

Some very important facts may be developed, a few of which I will take the liberty of pointing out.

It is not desirable to put seed into the ground until the ground is ready for the seed. The plant is from a torrid region—China being a warmer country than this. The length of the season is a great point in the cultivation of Sorghum.

On the last day of August, when we begin to eat grapes, the elements in the juice are malic acid and a trace of sugar. Five days later we find the malic acid is changed into sugar and another principle, tartaric acid. These are merely chemical states; they are nearly alike, still they are different. You have heard of the man in the court who often repeated the word *also*. A pert lawyer by the name of Smith, thought he would pick him up on it, and asked him why he used this word so constantly, and never used the word *likewise*, which he said meant the same. "Not so," said the man; "Mr. Jones over there is a lawyer, is he not?" "Yes." "Mr. Smith is, also." "Yes." "But he is not likewise." There is a slight difference.

Now these chemical products are made up of what chemists call ultimate elements. They are combined so curiously that we don't understand them: a little oxygen, a little hydrogen, and a little carbon; that we call gum, that malic acid—they are slightly different. We may imagine that when they run through each other as my fingers do—(excuse me, they are a little dirty, but that can't be helped here where they have such wretched hard water). We then have another product, with some of the elements combined differently. If this is true in the grape, and it is, when we harvest our grapes there is no malic acid, but there is tartaric acid, and there is sugar there, which four weeks before there was not.

Now for an application of these remarks to Sorghum. We yesterday were shown that from the finest cane came the poorest product; it took 12 gallons of juice to make one 1 gallon of syrup, while 4 1-10 gallons of other juice make a gallon of good syrup. These results are attributable to this fact: that the one was made from immature cane, which from the character of the soil or the season, was not matured; the other from cane which had gone through the various transformations necessary to give to the juice the saccharine elements. Now the great desideratum is to get the elements transformed to the condition which we desire.

One of the first observations which I made yesterday—(now I am the proprietor of no boiler, and have no interest in any machinery for manufacturing Sorghum; my only interest is such as you all ought to have—to produce the best sugar;) the observation I made was this: that at a certain stage of the maturity of the cane—when it begins to assume a yellow tinge, such as the straw of wheat has when it ripens—we have the greatest perfection of the juice. The lower joints always contain the richest juice, because the transformation of the growing vegetable is more complete, and the juice is more rich in saccharine matter.

As one who has dabbled somewhat in chemistry, I will allude to another fact. I was astonished, having looked into the general principles of the manufacture of sugar, that gentlemen, one after another, told us how they manufactured their syrup and sugar, and had not a word to say about the chemical facts. All the workmen insist on defecating the liquor; but our men in Ohio go to work without doing anything of that kind. You see the samples; they are very nice, but on tasting them you find something there that ought not to be there. As long as such producers get good prices for their syrup, they will continue to manufacture thus. But there is one friend from Miami who is an exception; he uses a defecating process, by which his product is cleared of those crude materials. It surprised me to find that what was good material produced a poor article. I have heard of men taking grog who didn't know it was grog, there was so much sugar in it!

Another thing pleased me much: that was the hearty determination with which all the men present entered into the consideration of the subject. It was delightful to see men come together with such singleness of purpose, and honesty of motive. I went into that meeting, expecting it to be a humbug; I expected to find that this man had a mill, and that man had a boiler, to advertise and sell; I expected it to be a manufacturers' meeting. But it was a very practical and harmonious meeting of actual growers and manufacturers of Sorghum.

Considering I didn't know much about Sorghum, I have said enough, so I will stop, for fear I may say something about which I don't know anything.

On motion of Mr. Millikin, it was agreed to hold the election for new members of the Board at 7 o'clock P. M.

On motion of Mr. McLung, the Convention took a recess till 2 o'clock.

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JANUARY 8, 2 O'CLOCK P. M.

The Secretary of the Board, Mr. Klippart, stated that there were a number of persons present who had been sent here to represent Societies that had held no

Fairs, nor complied with the organic act in other respects. Such delegates are not entitled to certificates authorizing them to draw money from the County Treasuries to pay their expenses to the Convention. He mentioned this, that such persons might not be disappointed.

Mr. Hitchcock, from the committee on credentials, reported as follows:

The committee on credentials report that from the credentials placed in their hands, they find all the delegates entitled to seats, except as follows:

From the County Society of Jefferson county, the Hon. Robert Sherrard, Jr., not a member of the Society, presents a certificate of appointment regularly made out, and the committee recommend he be admitted to a seat in the Convention. At the same time they would deprecate the custom of appointing those not members of Societies as delegates, and add that in the opinion of the committee, any man to be qualified for a seat in the General Assembly, should be a member of his County Agricultural Society.

From Ashland county, Messrs. Wm. B. McCarty and Wm. Osborn presented a regularly executed certificate of appointment, but their right to a seat was contested by Thomas Bushnell, of the same county. Both parties claimed to represent the true Agricultural Society of the county, and at length stated the grounds of contest. It appears that in 1851 a County Society was organized, under the law for the "encouragement of agriculture," in the county of Ashland, and for two years held its Fairs at Haysville, in that county. That after that time the Society removed to Ashland, under an arrangement to hold its Fairs in that place for a term of years, after which it was to return to Haysville. That since that time the Fairs have continued to be holden in the town of Ashland, and on account of this much bitterness of feeling has grown up, and the original Society having wandered somewhat from the regulations adopted by the State Board for the government of County Societies, attempt has, during the past year, been made to organize a new Society, locating it at Haysville.

It appears that the old Society, in 1860, lowered the fee for membership to seventy-five cents, and at its annual Fair in 1861, abandoned entirely the membership fee, paying premiums without reference to membership.

The case has been for the committee a somewhat difficult one to decide, but we conclude to recommend to the Convention the adoption of the following resolutions:

*Resolved*, That neither of the delegates from Ashland county are entitled to seats in this Convention, as representing County Societies complying with the law.

*Resolved further*, That we recommend to County Societies to conform their action strictly to the requirements of the law, and the regulations adopted by the State board of Agriculture.

Respectfully,

P. HITCHCOCK,
N. B. GATES,
F. ANDERSON,
P. W. NORRIS,
D. McMILLAN, Jr.,
*Committee.*

Mr. Bushnell. I see by the report of the committee that they do not recognize either Mr. McCarty or myself as entitled to a place in this Convention. If this be so, there will be no Fair held in our county this year. We have acted in good faith, and if I am set aside, I would ask the Convention to recognize some delegate from Ashland, that the people of the county be not deprived of the benefit of the law for which we are all taxed.

Mr. Millikin. I think it would be well to hear the reasons why the Society of 1851 is not entitled to a representation, and also a statement from the new organization.

Mr. Gates. According to the laws and regulations of the Board, the old Society certainly are not entitled to a representation; because the requirements of the law are, that members shall pay in their annual fee of one dollar, and that none others shall be entitled to a representation here. The old Society abandoned that rule, and reduced the fee, first to seventy-five cents, which annulled their right, and last year did away with the fee altogether. The committee were therefore satisfied that they are not entitled to their certificate to draw funds from the county, and consequently not entitled to seats in this body.

The other representative is from a new organization. They may have complied with the law in part, but are not entitled to a certificate, for the reason that they have never held a Fair. They must first hold a Fair, in compliance with the law. Again, the law requires an election in January, and they have not held an election at that time. Neither of these Societies, therefore, are entitled to a representation in this Convention.

Mr. Sherrard arose to a question of privilege. I have no fault to find with the report of the committee; but an insinuation is made that persons who claim to represent their counties in this Convention should not be entitled to a seat, if they are not members of the County Society. The reflection was intended for myself. I did not mean, this morning, to say that I was not a member of our County Society, but that I was not a member of the Agricultural Board. I have long been a member of the Society, and would like to have the report of the committee modified, so as to present the true state of the case.

Mr. Hitchcock remarked that he had misunderstood the gentleman; he didn't know that there was any harm done by the reflections in the report, but he would change it.

Mr. McCarty. I would like to state the grounds which induced our Society to partially change the rule, not of the organic law of the State Agricultural Society, but the rule of the State Board. We had been in the habit of adhering to those regulations, and issuing membership tickets; under those tickets there had been great frauds perpetrated; we found whole neighborhoods coming into the Fair grounds under those tickets. The receipts of the Society fell off, and we found we would have to do something to remedy the evil. I find upon consultation that the same difficulty has occurred in other counties, and that a similar remedy has been adopted; and I apprehend that if we went strictly into the matter, we would find few Societies whose representatives are entitled to seats here. I think even the State Board, in the Annual Fair, got around this difficulty in an equivocal manner. By charging a dollar for membership, and handing back four tickets, it evaded the rule; and it was done, I am informed, for the purpose of avoiding the abuse of membership tickets carrying in whole families.

As to the reduction of membership tickets, the committee have Mr. Bushnell's statement for it, and mine to the contrary; and I was the Secretary, and ought to know.

Mr. Hitchcock. The gentleman will notice that the language of the report is in regard to the abandonment of the membership fee of $1.

Mr. McCarty. At that time there was in existence a list of members, by the payment of a dollar fee, that exists to this day, and will not run out till the 15th of this month, for the fiscal year of the Society does not expire till the next annual meeting. We had adopted a rule to reserve from the awards of premiums that amounted to over $3, one dollar to constitute the party a member for the next year—making the payment six months in advance. Whether we have erred in allowing exhibiters to enter into competition without paying a fee, is to be determined; but the plan succeeded admirably. At our last Fair, we found the receipts were fully equal to those of the year before, although the weather was unfavorable. We paid all our premiums, and have a surplus of over $100 in the treasury. If we have erred in one particular, it is very harsh to say that the Society should be blotted out of existence, when we have the means and ability to keep up a good one.

Mr. Bushnell. Would it be out of order to ask the committee to read the evidence presented before them?

Mr. Millikin suggested that Mr. Bushnell refer to such parts of the evidence as he wished to present. Leave being granted, he proceeded to read from the advertising bill of the old Society's Fair, remarking that just before the bill was issued, Mr. Osborn introduced a resolution to dispense with the regular fee of one dollar, and the whole Board voted for it except himself. The bill says, "admission fee, one dime;" and he asserted that there was not a member of the Society in the county of Ashland who paid a dollar to that Society during the past year.

Mr. McMillan thought it inadvisable to hear this matter, inasmuch as it had been heard before the committee.

Mr. Norris was of the same opinion, and, as one of the committee, had thought it best to send the delegates back to settle their own broils, rather than occupy the time of this Convention with them.

Mr. Townshend. It seems to me that the members in Mr. McCarty's Society have paid in their fees of $1 up to the close of the year. If this is so, their organization is still alive, and is entitled to representation on this floor.

Mr. Bushnell. That membership expired in 1860, or last January. That year they charged seventy-five cents, and in 1861 didn't charge anything.

Mr. McCarty. In 1860 we retained $1 fees out of the premiums, which fees were for 1861.

It was moved to amend the report of the committee, by striking out all after the word resolved, and say "Mr. Bushnell is entitled to a seat." Yeas 11, nays 22. Lost

A resolution to amend, by giving the seat to Mr. McCarty, was also lost. The report was then adopted.

On motion of Mr. Townshend, members of all Agricultural Societies, including the gentlemen just refused seats as delegates, were invited to take part in the deliberations of this Convention, without voting.

The delegates from Ashland were permitted to withdraw their reports.

On motion of Mr. Easton, his resolution that was laid on the table this morning, was then taken up, viz:

*Resolved*, At the annual meeting of the Huron County Agricultural Society, that the meeting of the State Society be requested to pass a resolution, asking the Legislature to pass a law prohibiting horses, cattle, hogs and sheep from running at large on the highways of the State; or, that the lands in highways be remitted from taxation.

Mr. Patterson moved to amend, so that we shall only ask that animals shall not be allowed to run at large, leaving out the portion in regard to taxation. Carried.

Mr. Easton. I offered the resolution because I was instructed so to do by our County Society. I hope it will meet the views of the Convention, and that the Legislature will favor it, that we may not be so perpetually annoyed with other people's stock.

Mr. Millikin. The resolution, or something similar, has been adopted on one or two previous occasions; it has been discussed two or three years, and I believe it is out of the question to get the Legislature to make a law on the subject. The evil is a serious one. It imposes an expense of $300,000 in my county to keep up and repair our fences. It would be of exceeding great importance if it could be carried out; but it is not necessary to present it at this time; many counties are not ready, and therefore there will be no law passed.

Mr. Easton. There have been many things petitioned for that have not yet been granted. I see no reason, however, why we should not continue to petition. It has been said that some counties are not ready; they may need this very action and discussion to make them ready.

The question was called for, and the resolution as amended was adopted.

The resolution of Mr. Joy was taken from the table, viz:

*Resolved*, That this Convention do memorialize the General Assembly of this State to enact a law requiring railroad companies to fence their respective roads.

*Resolved further*, That a committee of three be appointed by the President of this Convention to prepare and present such memorial, together with these resolutions, and to confer with the proper committees of the two Houses of the General Assembly on the subject.

Mr. Byers. Is there not a law giving railroads a certain number of years before requiring them to fence their roads?

Mr. Joy. There is a law requiring railroads to be fenced within a certain time; but the law provides that the owners of real estate shall compensate railroad companies by paying one-half the expense. As to the propriety of this Convention passing such a resolution, I think it must be admitted that a vast number of persons are interested in it. I see by the government reports that there are 3,000 miles of railroad in the State. By the present law, the owners of real estate lying on the roads are required to sustain half the expense. Now, there is no impropriety in this when roads run on division lines; but this is not usually the case. And when they do not, farmers have to build fences where they do not wish to, for the benefit of the public. No one will attempt to argue that the roads are nuisances; but I think the generous public ought to bear this burden, and not force it upon persons who have farms cut up by the roads. Those who have land cut up by the roads derive no more advantage from them than those whose land lies a few miles from them. To build these 3,000 miles of fence will cost $500,000, and is it not unfair to require the few individuals who have railroads running through their lands to pay this enormous sum? Let it fall equally on all parties.

Mr. Sherrard. I would refer the gentleman to the 18th section of an act, under the title of corporations. There was a law passed in 1859, to take effect on the 25th of March, 1859, requiring railroad companies to fence in their roads. At the last session of the Legislature, I find the time was extended, requiring them, within two years from the date of the passage of the act, to fence their roads. So that the object the gentleman wishes to attain he will realize if he lives till the 29th day of next March.

The question was put, and the resolution was not adopted.

Mr. Gates offered the following:

*Resolved,* That the Legislature of Ohio be requested to pass a law for the extermination of the dog nuisance.

Mr. Gates. I wish to make a few remarks on this resolution. I commence my legislative existence here where I left it four years ago. I then pitched into the dogs, and I hold the same opinion still. I am an enemy to the whole dog creation, and I have some reason to be. We have had some legislation on the subject, but we have not had enough. We have not struck at the nuisance so as to annihilate it. If I were clothed with omnipotent power, my first act would be to annihilate the dogs.

The Secretaries of Boards of Agriculture show a loss to farmers, for the year 1861, of $100,000, in the way of sheep killed by dogs. Our Legislature don't like to meet the dog question. The constitution is in the way, and their dog constituencies are in the way. They have many voters who own nothing but dogs. You can't reach such parties by taxation. I have a tenant who has a wife and four children, and a dog; and what he don't steal, to support himself, children and dog, the people have to pay. We have a good many such.

I have known farmers who bought a few sheep, and started with fair prospects; but they have been driven out of the business by the depradations of dogs. I have known more quarrels arise over a miserable cur, than from any other cause. I have known a Presbyterian deacon—a very peaceable man—whose only difficulty with a neighbor—whose only fight—arose from a dog difficulty. I have an only son, ten years of age, who was severely bitten by a dog when quietly walking along the streets. I see members of the Legislature here, and I hope they will hear my appeal. On the question I hope we may have an unanimous vote. It is a serious matter: as we are short of cotton, we must encourage the growth of wool. We don't begin to grow wool enough, and in order to increase its growth, we must annihilate the dogs.

Mr Runyon. The gentleman says he has a tenant on his farm who is a thief. If that is a fact, he ought to suffer from the dogs.

Mr. Gates. I am an overseer of the poor, and we have to support thieves as well as other paupers. Besides, we sometimes know a thing when we can't prove it.

The resolution was adopted by a slight majority.

Mr. Donnelly moved to take from the table the resolution in regard to holding the elections of County Societies in January; which was not agreed to.

A communication was received from the Sorghum Convention.

On motion of Mr. Gates, the communication was referred to the acting Board.

Recess till seven o'clock.

SEVEN O'CLOCK P. M.

The chairman stated that the first business would be the election of five members of the Board.

Mr. Sherrard offered the following resolution:

WHEREAS, The agricultural interests of the State are the interests of the people; therefore,

*Resolved*, That, in order to have the people of the entire State represented, it should be the aim of the members of this Convention, in making selections for members of the State Board, to select the same with reference to location, that no single portion of the State shall have more than one member in said Board.

The resolution was not adopted.

The chair appointed as tellers Messrs. Hitchcock and Dana.

On the first ballot, votes were cast as follows:

H. P. Cannon, 4; B. S. Runyon, 16; Geo. McCullough, 10; J. M. Glover, 10; N. J. Turney, 16; M. M. Munson, 11; Wm. Taggart, 24; H. B. Perkins, 25; T. C. Jones, 27; Wm. R. Putnam, 18; Jacob Egbert, 30; N. S. Townshend, 29; John Reber, 11; W. B. McClung, 12; J. Gill, 5; A. E. Strickle, 3; J. G. Dun, 1.

Twenty-six votes being necessary to a choice, Messrs. T. C. Jones, Jacob Egbert and N. S Townshend, were declared to be elected.

On the second ballot, there was no choice.

Mr. Gates advocated the election of Mr. Perkins, for various reasons—but especially because he was a monied man, and in these times such an influence was much needed.

On the third ballot, H. B. Perkins received 36 votes, and was declared elected.

A motion by Mr. Sherrard, that Mr. Taggart, who had the next highest vote (25) on the ballot just taken, be chosen by acclamation, was decided to be out of order.

On the fourth ballot, N. J. Turney received 27 votes, and was declared to be elected.

On motion of Mr. Burt, the Convention adjourned sine die; whereupon the President took leave of the State Board and his agricultural friends in the following remarks:

GENTLEMEN: I have prepared nothing to say to you, but it occurs to me to say a few words, thanking you for the constant kindness I have received at your hands.

I first met with you two years ago, coming from a remote part of the State, and was made a member of the Board, and by it made President, not out of any personal regard for me, but out of respect for the region of the State of which I am a representative. The meetings of our Board have been harmonious and agreeable. That we have been favored by the people of the State in our efforts to sustain the State Fair, when others have given way—that our people have felt it at heart to give to our State a pre-eminence—manifests its strength and stability. That, though the Union, blessed mother of us all, has been shaken to the centre, the State of Ohio, the heart of the Union, having enlisted soldiers for the war, can carry on the triumphs of peace. We have been blessed with plentiful harvests, and from an empty treasury we now present to our successors a respectable fund.

In parting with a few members of the Board, it is done by those who have been associated with them, with feelings of the greatest kindness and marked sensibility. We trust the new members may be equally acceptable and useful.

We part, many not again to meet. I am happy to meet with so many who have been accustomed to come up with us and counsel together, but the nature of our times has a tendency to disperse us. I trust we may carry to our homes pleasant recollections of pleasant business, dispatched with remarkable speed. I trust we may bear with us the determination that this great interest shall never flag; that our soil shall be improved by the best culture, and that we shall throw around our homes such interests and such charms as shall lure back our sons in the field, and make our homes prosperous and happy in the future. (Applause.)

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WEDNESDAY EVENING, Jan. 8th, 1862.

Board met in Agricultural Rooms. Members all present, except C. W. Potwin and N. J. Turney.

The following officers for 1862 were chosen by ballot:

*President*—T. C. Jones, Delaware.

*Recording Secretary*—H. B. Perkins, Warren.

*Treasurer*—D. Tayler, Columbus.

*Corresponding Secretary*—J. H. Klippart, Columbus.

On motion, it was

*Resolved*, That during the ensuing year the Board will not make any appropriation for clerk hire, except during the time of the Fair.

*Ordered*, That David Tayler be allowed $5, to refund the amount paid by him at Dayton to Gillespie.

On motion, N. S. Townshend and H. B. Perkins were appointed a committee to examine the accounts of the Treasurer and Executive Committee.

On motion,

*Resolved*, That his Excellency Governor Tod be requested to present to the Ohio State Board of Agriculture the original manuscript address of the Hon. Geo. Tod, first President of the Agricultural Society organized at Youngstown in the year 1818.

On motion, adjourned until Thursday morning.

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THURSDAY MORNING, Jan 9th, 1862.

Same members present. The President appointed Messrs. Townshend, De Witt and Perkins to act with him as Executive Committee.

On motion,

*Resolved*, That the Board hold its next Fair at the city of Cleveland, provided that a bond, to the satisfaction of the Executive Committee, for the payment of the sum of five thousand dollars, as the committee shall direct, and for furnishing proper grounds and ordinary railroad facilities, shall be tendered to this committee; the ground to be such as the committee shall approve. And in case the city of Cleveland shall neglect in any respect to comply with the above conditions within twenty days, the committee shall proceed to make arrangements to hold the Fair at Columbus, upon the terms proposed by the latter city.

*Voted*, That the sum of $20 be allowed to Follett, Foster & Co., as balance due on Premium List.

*Voted*, That the sum of $10 be allowed B Stedman, for money advanced by him for goods lost at Cleveland Fair.

On motion, the Board adjourned to meet at the call of the President.

H. B. PERKINS, *Recording Secretary*.

Attest: J. H. KLIPPART, *Corresponding Secretary*.

## STATE FAIR.

The State Fair for 1861 was held on the same grounds where the Fair had been held the previous year, near the city of Dayton. There appears to be a general belief that regular annual storms take place about the time of the autumnal equinoxes. The Fair of 1860 was held on the 25th, 26th, 27th and 28th of September; during the greater portion of these days the weather was exceedingly unfavorable, and in order to avoid a like occurrence, the Fair for 1861 was fixed on the 10th, 11th, 12th and 13th days of September. The event justified the change; for notwithstanding the weather was not so fair as was desirable, yet there was less absolutely foul weather than the year preceding.

All things considered, the Fair was a greater success than could well have been expected under the circumstances. Almost all the industrial avocations of the people were interrupted, the ordinary channels of commerce from the State south obstructed, and almost the entire business affairs of the nation deranged—the people had scarcely recovered from the shock and consequent gloom spread over the country by the battle of Bull's Run, which occurred less than sixty days before the Fair; yet, notwithstanding all these unfavorable surrounding circumstances, the attendance of visitors was very fair indeed, and the articles on exhibition scarcely less than in the preceding year.

Annexed are entries of cattle and horses, together with the reports and awards of the several committees in the various departments of the exhibition.

### CATTLE.

#### SHORTHORNS.

| | | |
|---|---|---|
| W. White, Centreville, O. | Bull | 3 years. |
| J. P. Mumma, Dayton, O. | “ | 4 “ |
| G. W. Coulter, Reesville, O. | “ Challenger | 4 “ |
| Joseph Kennedy, Dayton, O. | “ Gov. Corwin | 3 “ |
| Nathan Dewey, South Bloomfield, O. | “ Brutus | 5 “ |
| Wm. Palmer, Bloomington, O. | “ Fayette | 3 “ |
| W. P. Dunlap, Xenia, O. | “ Xenia | 3 “ |
| Wm. Mathews, Etna, O. | “ Starlight, 2d | 5 “ |
| A. Coulter, Reesville, O. | “ Richard Booth | 4 “ |
| D. McMillan, Jr., Xenia, O. | “ Belted Knight | 2 “ |
| Alfred Coulter, Reesville, O. | “ Warrior | 2 “ |
| Z. Vesey, Reynoldsburg, O. | “ Duke of Plumwood | 19 mos. |
| D. McMillan, Jr., Xenia, O. | Bull calf Duke of Oakland | 5 “ |
| David Crall, Lima, O. | Bull calf | 10 “ |
| D. McMillan, Jr., Xenia, O. | Cow Sunbeam | 5 years. |
| “ “ | “ Darling | 5 “ |
| Geo. M. Coulter, Reesville, O | “ Louan | 4 “ |
| Wm. Palmer, Bloomington, O. | “ Prairie Flower | Aged. |

| | | |
|---|---|---|
| Isaac C. Hawkins, Clarksville, O. | Cow Rosanna | Aged. |
| C. M. Clark, Springfield, O. | “ Easter Day | 8 years. |
| “ “ | “ Dove | 3 “ |
| Jacob Stultz, Dayton, O. | “ Piny | 7 “ |
| D. McMillan, Jr., Xenia, O. | Heifer Sunbeam, 2d | 2 “ |
| “ “ | “ Elsie | 2 “ |
| “ “ | “ Jessie | 2 “ |
| J. P. Mumma, Dayton, O. | “ Mary | 2 “ |
| J. W. Griffin, Bartonia, Ind. | “ Betsy Baker | 2 “ |
| Wm. Palmer, Bloomington, O. | “ Linda Bell | 2 “ |
| C. M. Clark, Springfield, O. | “ Flora Bell | 2 “ |
| D. McMillan, Xenia, O. | “ Miss Ophelia | 1 year. |
| David Pyle, Clarksville, O. | “ | 1 “ |
| C. M. Clark, Springfield, O. | “ Anna Hunt | 1 “ |
| “ “ | “ Snowdrop | 1 “ |
| “ “ | “ White Lady | 1 “ |
| Wm. Mathews, Etna, O. | “ Lizzie | 1 “ |
| “ “ | “ Tolona | 1 “ |
| D McMillan, Xenia, O. | Calf Madge | 9 mos. |
| “ “ | “ Sunbeam, 4th | 3 “ |
| Jacob Stultz, Dayton, O. | “ | 3 “ |
| Wm. Palmer, Bloomington, O. | “ | |
| C. M. Clark, Springfield, O. | “ Fanny Fern | 10 “ |
| Wm. Mathews, Etna, O. | “ Anna | 10 “ |
| “ “ | “ Martha | 8 “ |

### DEVONS.

| | | |
|---|---|---|
| G. M. Fisher, Elyria, O. | Bull Chipman | 4 years. |
| E. Matchem, Pittsfield, O. | “ Nero | 4 “ |
| “ “ | Cow Lady Weston | 7 “ |
| “ “ | Calf Eva | 6 mos. |

### WORK OXEN AND STEERS.

| | | |
|---|---|---|
| John Enoch Jr., West Liberty, O. | Yoke work oxen | 5 years. |
| Wm. Brock, Grape Grove, O. | “ “ | 4 “ |
| “ “ | “ “ | 5 “ |
| Wm. Palmer, Bloomington, O. | “ “ | 4 “ |
| “ “ | Steer, grass fed | 3 “ |
| F. A. Brock, Selma. O. | “ “ | 3 “ |
| John Enoch, Jr., West Liberty, O. | Steer, fat | 5 “ |
| “ “ | “ | 5 “ |
| Wm. Brock, Grape Grove, O. | “ | 3 “ |
| J. P. Mumma, Dayton, O. | Milch cow | 2 “ |

### SWEEPSTAKES.

| | | |
|---|---|---|
| D. McMillan, Jr., Xenia, O. | Bull Belted Knight, cows Lady Watson, Darling, Jessie, Elsie. | |
| “ “ | Bull Duke of Oakland, cows Duchess of Oakland, Maud, Madge, Sunbeam, 4th. | |
| C. M. Clark, Springfield, O. | Bull New-Year's Day, cows Easter Day, Dove, Flora Bell, Anna. | |
| Wm. Palmer, Bloomington, O. | Bull Warrior and 5 calves. | |
| D. McMillan, Jr., Xenia, O. | “ Belted Knight | 2 years. |
| G. M. Coulter, Reesville, O. | “ Challenger | 4 “ |
| Alfred Coulter, Reesville, O. | “ Richard Boothe | 4 “ |
| Joseph Kennedy, Dayton, O. | “ Gov. Corwin | 3 “ |
| N. Denny, South Bloomfield, O. | “ Brutus | 5 “ |
| W. Palmer, Bloomington, O. | “ Fayette | |
| Z. Vosey, Reynoldsburg, O. | “ Duke of Plumwood | |
| C. M. Clark, Springfield, O. | “ New-Year's Day | |
| J. P. Mumma, Dayton, O. | “ Perfection | |
| W. Mathews, Etna, O. | “ Starlight, 2d | |
| D. McMillan, Jr., Xenia, O. | Cow Sunbeam | 5 years. |
| “ “ | “ Darling | 5 “ |
| “ “ | Heifer Sunbeam, 2d | 2 “ |
| “ “ | “ Elsie | 2 “ |
| “ “ | Cow Lady Watson | 7 “ |
| G. M. Coulter, Reesville, O. | “ Louan | 4 “ |
| W. Palmer, Bloomington, O. | “ Prairie Flower | |
| “ “ | “ Linda Bell | |
| D. McMillan, Jr., Xenia, O. | “ Jessie | |
| Isaac C. Hawkins, Clarksville, O. | “ Rosanna | |
| C. M. Clark, Springfield, O. | “ Easter Day | |
| “ “ | “ Dove | |
| “ “ | “ Flora Bell | |
| J. P. Mumma, Dayton, O. | Heifer Mary | |

## HORSES.

### THOROUGHBRED.

| | | |
|---|---|---|
| J. C. Vance, Urbana, O. | Stallion Fearnought | 4 years. |
| Hamilton & Seal, Bellebrook, O. | “ Tariff | 4 “ |
| Abner Jennings, Urbana, O. | “ Nutwood | 3 “ |
| Sam. Alexander, Jamestown, O. | “ Boston | 3 “ |
| Hamilton Wilson, Somerford, O. | “ Mickey Free | 2 “ |
| Reber & Kutz, Lancaster, O. | “ Dangerous | 2 “ |
| “ “ | “ Alarm | 2 “ |
| J. C. Wilson, Dayton, O. | “ Eber | 1 year. |

| | | | | |
|---|---|---|---|---|
| H. Wilson, Somerford, O. | Stallion | Mayflower | 1 | year. |
| J. C. Wilson, Dayton, O. | Mare | Fan | 11 | years. |
| J. S. Rarey, Groveport, O. | " | Lady Thetis | 8 | " |
| R. G. Corwin, Dayton, O. | " | Miss Mattie | 7 | " |
| J. C. Vance, Urbana, O. | " | Lady McClellan | 4 | " |
| Abner Jennings, Urbana, O. | " | | 2 | " |
| " " | " | | 2 | " |

### ROADSTERS.

| | | | | |
|---|---|---|---|---|
| Abner Jennings, Urbana, O. | Stallion | Mora | Aged. | |
| Norton Smithers, Troy, O. | " | Gray Eagle | 4 | years. |
| S. T. Turner, Grand Rapids, Mich. | " | Washtenau Chief | 11 | " |
| W. Bain, Xenia, O. | " | Duke of New Orleans | 4 | " |
| James Alexander, Jamestown, O. | " | Tom Benton | 8 | " |
| E. S. Kilbourne, Sidney, O. | " | Black Warrior | 7 | " |
| J. F. Corault, Troy, O. | " | Morgan | 6 | " |
| Richard Nevins, Columbus, O. | " | Joe Godwin | 6 | " |
| Henry Cromwell, Xenia, O. | " | Gray Cloud | 7 | " |
| Hiram Stokes, Middleburg, O. | " | Peter Mackle | 8 | " |
| Wm. D. Mason, West Jefferson, O. | " | W. H. Clement | 3 | " |
| J. T. Warder, Springfield, O. | " | Harry | 3 | " |
| " " | " | George | 3 | " |
| B. D. Woodmansee, Hamilton, O. | " | King Morgan | 3 | " |
| D. P. Larkin, Selma, O. | " | Young Stanwix | 3 | " |
| Martin Peterson, Xenia, O. | " | Monarch | 3 | " |
| W. C. Davis, Dayton, O. | " | Nutwood | 2 | " |
| D. V. Pottle, Xenia, O. | " | Boston Monarch | 2 | " |
| W. O. Reim, Springfield, O. | " | Paragon Morgan | 2 | " |
| W. D. Mason, Xenia, O. | " | Fearnought | 2 | " |
| A. J. Ryan, West Jefferson, O. | " | Yellow Jacket | 1 | year. |
| R. H. Burgdill, Jamestown, O | Mare | | 6 | years. |
| D. D. Moore, Xenia, O. | " | Poll | 7 | " |
| " " | " | Fanny Fern | 4 | " |
| S. Pearson, Dayton, O. | " | Kitty | 10 | " |
| S. Eldridge, Lebanon, O. | " | Eliza Logan | 8 | " |
| A. C. Jennings, Urbana, O. | " | Alice | 6 | " |
| W. D. Mason, West Jefferson, O. | " | Lady Putnam | 6 | " |
| A. J. Ryan, " | " | Donna | 3 | " |
| Evans & Perrine, Lebanon, O. | " | Mag | 3 | " |
| Robert Way, Xenia, O. | Filly | Isabel | 2 | years. |
| M. Burgdill, Bellbrook, O. | " | Queen | 2 | " |
| A. C. Jennings, Urbana, O. | " | Ethelinda Jackson | 2 | " |
| " " | " | Jenny Wallace | 2 | " |
| Adam Garlaugh, Alpha, O. | " | Dolly | 1 | year. |

| | | | | |
|---|---|---|---|---|
| D. P. Larkin, Selma, O. | Filly | | 1 | year. |
| Isaac Dingler, Bellbrook, O. | " | Flora | 1 | " |
| M. Burgdill, " | " | Kate | 1 | " |
| R. H. Burgdill, Jamestown, O. | Mare colt | | 3 | mos. |
| J. W. Harris, Dayton, O. | 6 Shetland ponies | | | |
| Houston Lowe, " | " " | | | |

### HORSES FOR GENERAL PURPOSES.

| | | | | |
|---|---|---|---|---|
| Jacob Wise, Johnsville, O. | Stallion | Tom | 6 | years. |
| Jesse Parsons, Alexanderville, O | " | Harry Searcher | 8 | " |
| Jacob Tippy, Harshmansville, O. | " | Plowboy Morgan | 8 | " |
| Z. Brown, Darrtown, O. | " | Highlander | 4 | " |
| C. B. Clarke, Dayton, O. | " | Glencoe | 5 | " |
| Geo. E. Webber, Hinckley, O. | " | Eastman Morgan | 12 | " |
| L. D. Woodmansee, Hamilton, O. | " | Tom Rolf | 6 | " |
| Wm. Curtis, London, O | " | Paragon | 4 | " |
| D. P. Egbert, Lebanon, O. | " | Wagner | 6 | " |
| E. F. Lemon, Urbana, O. | " | Western Eclipse | 4 | " |
| Wm Reed, Monroe, O. | " | Perfection | 8 | " |
| T. Phelps, Blendon, O. | " | Young Telegraph | 6 | " |
| Seven Mile Stock Co., Seven Mile, O. | " | Victor | 11 | " |
| Thomas Hagan, Seven Mile, O. | " | Bellfounder | 8 | " |
| A. D Cline, Mason, O. | " | Bill Clay | 6 | " |
| G. D. Shields, Springborough, O. | " | Butler Boy | 7 | " |
| A. Robbins, Fletcher, O. | " | Black Highlander | 8 | " |
| Elisha Soward, Bellbrook, O. | " | Archy Bellfounder | 6 | " |
| Wm. Swails, Troy, O. | " | Young Monarch | 4 | " |
| D. G. Leigh, Princeton, O. | " | Membrino | 7 | " |
| Z. Mason, Darrtown, O. | " | Perfection | 3 | " |
| P. Vinnidge, Hamilton, O. | " | Belmont | 3 | " |
| James Wycoff, Middletown, O. | " | Forest | 3 | " |
| W. M. Richards, Jamestown, O. | " | Young Guyan | 3 | " |
| J. C. Hoffman, Germantown, O. | " | Morgan | 3 | " |
| Samuel McKee, Seven Mile, O. | " | Bourbon | 3 | " |
| G. D. Shields. Jr., Paddy's Run, O. | " | Black Aleck | 3 | " |
| Wm. D. Mason, West Jefferson, O. | " | Tom Pennington | 2 | " |
| Henry Swaderner, Dayton, O. | " | Colt | 2 | " |
| W. C. Davis, " | " | Iron Duke | 2 | " |
| " " | " | Tom Salter | 2 | " |
| R. H. Burgdill, Jamestown, O. | " | Young Highflyer | 2 | " |
| Isaac Smith, Eaton, O. | " | Tickler | 2 | " |
| F. A. Bolser, Carthage, O. | " | Young America | 2 | " |
| Henry Shaffer, Le Sourdsville, O. | " | Perfection | 2 | " |
| R. C. Stewart, Seven Mile, O. | " | Butler | 2 | " |

| | | | |
|---|---|---|---|
| B. D. Anderson, Xenia, O. | Stallion | Young Glencoe | 2 years. |
| A. H. Long, New Jasper, O. | " | Monarch | 2 " |
| John Shroyer, New Carlisle, O. | " | Monarch | 1 year. |
| F. A. Bolser, Carthage, O. | " | Young Perfection | 1 " |
| Wm. Reed, Monroe, O | " | Stockholder | 1 " |
| Austin Hudson, South Solon, O. | " | Louden Roan | 1 " |
| George C. Kemp, Germantown, O. | " | Frank | 1 " |
| John Hines, Dayton, O. | Colt | Sam Hazard | 4 mos. |
| Wash. Dixon, Columbus, O. | " | en | |
| Philip Wier, Ridgeville, O. | " | Ben | 5 mos. |
| R. H Burgdill, Jamestown, O | Horse colt | | |
| D. P. Larkin, Selma, O. | " " | | |
| George Francis, Germantown, O. | Colt | Ed. Forrest | 4 mos. |
| R. C. Stewart, Seven Mile, O. | Horse colt | | |
| J. M Stewart, " | " " | | |
| John Stroup, Springborough, O. | " " | | 4 mos. |
| John Hines, Dayton, O. | Mare | Jenny | 9 years. |
| " " | " | Lucy | 4 " |
| Wash Dixon, Columbus, O. | " | Fan | 7 " |
| Philip Wier, Ridgeville, O. | " | Fan | 8 " |
| John Shroyer, New Carlisle, O. | " | Nellie | 8 " |
| Adam Gerlaugh, Alpha, O. | " | Bet | 8 " |
| R. H. Burgdill, Jamestown, O. | " | | 7 " |
| D. P. Larkin, Selma, O. | Brood mare | | 9 " |
| " " | " " | | 5 " |
| David Patton, Camden, O. | " " | Kate | 4 " |
| R. C. Stewart, Seven Mile, O. | Mare | Soco | 11 " |
| J. M. Stewart, " | " | Bay Highlander | |
| W. C Stewart, " | " | Jenny Lind | 4 years. |
| John Stroup, Springborough, O. | " | Poll | 11 " |
| B. Ramsey, Centreville, O. | " | Brood | 8 " |
| Elisha Soward, Bellebrook, O. | " | Bolley | 4 " |
| Evans & Perrine, Lebanon, O. | " | Jen | 4 " |
| Jacob Carr, Washington, O. | " | Lady Scott | 6 " |
| J. C. Wilson, Dayton, O. | " | Nan | 3 " |
| A F. Hipps, St. Marys, O. | " | Kitty Clyde | 3 " |
| W. H. Hopping & Bro., W. Jasper, O. | " | Laura | 3 " |
| R. C. Stewart, Seven Mile, O. | " | Flora Duncan | 3 " |
| T. G. White, Centreville, O. | " | | 3 " |
| D. H. Clemmer, Johnsville, O. | Filly | Doll | 2 years. |
| James Ogan, Dayton, O. | " | Jenny | 2 " |
| James Hopkins, Bellebrook, O. | " | Kate | 2 " |
| Samuel Andrews, Dayton, O. | " | Lady Belle | 2 " |
| Z. Brown, Darrtown, O. | " | Fanny | 1 year. |

| | | | | |
|---|---|---|---|---|
| Wm. Prest, Middletown, O. | Filly | | 1 | year. |
| W. H. Hopping, New Jasper, O. | " | Fanny Fern | 1 | " |
| W. M. Richards, Jamestown, O. | " | | 1 | " |
| J. C. Wilson, Dayton, O. | Mare colt | | | |
| John Shroyer, New Carlisle, O. | " " | Monarch | | |
| R H. Burgdill, Jamestown, O. | " " | | | |
| " " | " " | | | |
| Wm Prest, Middletown, O. | " " | | | |
| D. P. Larkin, Selma, O | " " | | | |
| R. C. Stewart, Seven Mile, O. | " " | | | |
| Wm. C. Stewart, " | " " | | | |

### DRAFT HORSES.

| | | | | |
|---|---|---|---|---|
| J. P. Mumma, Dayton, O | Stallion | Samson | 5 | years. |
| W. B. Gest, West Liberty, O | " | | 4 | " |
| David Brown, Brant, O | " | Ben | 7 | " |
| J. R. Marshall, Xenia, O | " | Prince Napoleon | 4 | " |
| Method & Co., Miamisburg, O | " | Canadian Highflyer | 5 | " |
| W. Beals & Co., McLaughlin's St'n, Pa. | " | England's Glory | 6 | " |
| F. Duxel, Enon, O | " | Joseph Finley | 7 | " |
| A. G. Franklin, Greenfield, O | " | Black Traveler | 9 | " |
| D. G. Lee, Hamilton, O | " | Membrino | 6 | " |
| James Alexander, Jamestown, O | " | Jim | 8 | " |
| O. Colwell, Woodstock, O | " | Young America | 4 | " |
| J. Wolf, Xenia, O | " | Prince Napoleon | 4 | " |
| C B. Adams, Clifton, O | " | Sir William Wallace | 9 | " |
| W. H. H. Bristol, London, O | " | Ohio Prince | 3 | " |
| E. Rudy, Troy, O | " | Trustee | | |
| Jas Marshall, Xenia, O | " | Bay Norman | 2 | " |
| G. Farrington, Mechanicsburg, O | " | Lion | | |
| J. R. Marshall, Xenia, O | " | colt | 1 | year. |
| Adam Gerlaugh, Alpha, O | " | " Charmer | | |
| Jos. Rudy, Hyattsville, O | " | " Jim | | |
| F. Burgdill, Bellebrook, O | " | " Norman | | |
| Isaac Swadener, Alpha, O | " | " French Norman | | |
| J. R. Marshall, Xenia, O | " | " | | |
| A. M. Townsley, Cedarville, O | " | " | | |
| Jacob Raff, Alexanderville, O | Mare | Lize | 9 | years. |
| John Shroyer, New Carlisle, O | " | Nelly | 8 | " |
| Wm. Swailes, Troy, O | " | Mary | 4 | " |
| J. P. Mumma, Dayton, O | " | Tip | 15 | " |
| H. McClure, Bellebrook, O | " | Betsey Hercules | 6 | " |
| Thos. Robinson, New California, O | " | Amanda | 4 | " |
| Thos. Cramer, Bellebrook, O | " | Lady Napoleon | 6 | " |

| | | |
|---|---|---|
| J. N. Bonner, Dayton, O | Mare Bolly | 9 years. |
| Wm. Bain, Xenia, O | " Nelly | 4 " |
| Thos. Robinson, New California, O | " Nor | 3 " |
| Jas. Marshall, Xenia, O | Filly | 2 " |
| G. Farrington, Mechanicsburg, O | " Kate | |
| Harvey Shields, Xenia, O | " Lady Monarch | |
| Jas. Marshall, Xenia, O | Mare colt | 4 m'ths |
| R. H. Burgdill, Jamestown, O | " " | |
| " " | " " | |

### MATCHED HORSES AND MARES.

| | | |
|---|---|---|
| Adrian A. Schenck, Franklin, O | Pair matched roadsters, geld., | 4 & 5 ys. |
| Howard & Van Meter, Woodstock, O | " " " mares. | |
| J. A. Johnson, Urbana, O | " " " | 5 " |
| W. R. F. Ayres, Dayton, O | " " " | 6 " |
| Henry Ten Eyk, Hyattsville, O | " " " mares, | 5 " |
| D. Mason, Waynesville, O | " " " " | 5 " |
| E. Hawker, Dayton, O | " " " " | 4 " |
| Isaac Emboden, Miamisburg, O | " coach horses. | |
| B. Stout, Hamilton, O | " " " | |
| Henry Ten Eyk, Hyattsville, O | " " " | 6 " |
| H. M Heaver, Urbana, O | " " " geldings. | 4 " |
| Jacob Egbert, Lebanon, O | " " " | 6 & 7 " |
| Peter Long, Dayton, O | " " " | 4 & 5 " |
| R. P. Evans, Franklin, O | " " " mares | 6 " |
| D. P. Egbert, Lebanon, O | " " " " | 4 " |
| Josiah Beard, Darby Creek, O | " farm or draft horses. | 3 " |
| J. A. Johnson, Urbana, O | " matched mares | 4 & 5 " |
| D. W. Henderson, Clintonville, O | " farm or draft horses | 8 " |
| A. Hildbutt, Camden, O | " " " " | 5 & 8 " |
| W. H. Kent, Dayton, O | " " " " | 5 & 6 " |
| W. Bain, Xenia, O | " " " mares | 4 & 5 " |
| J. O'Neal, Dayton, O | " " " geldings | 5 & 7 " |
| Thos. Robinson, New California, O | " " " mares | 4 " |
| Isaac Stansell, Centreville, O | " " " " | 8 & 4 " |
| J. A. Thompson, Miamisburg, O | Harness gelding Perriodoncus | 3 " |
| J. N. Lefever, Dayton, O | " " Reuben | 4 " |
| Martin Johnson, Vandalia, O | " " James | 4 " |
| L. D. Woodmansee, Hamilton, O | " " Copper Bottom | 6 " |
| Wm. Bain, Xenia, O | " " Col. Sanders | 4 " |
| Joshua Brown, Jamestown, O | " " Sam | 4 " |
| S. Wiggins, Dayton, O | " " Charley | 6 " |
| D. C. Kent, Dayton, O | " " Frank | 6 " |
| Jonah Bull, Dayton, O | " " Prince | 6 " |

| | | | | |
|---|---|---|---|---|
| J. A. Johnson, Urbana, O | Harness | gelding | Gray | 4 ys. |
| W. R. F. Ayres, Dayton, O | “ | “ | | 6 “ |
| C. Peterson, Xenia, O | “ | “ | Pete | 4 “ |
| Henry Ten Eyk, Hyattsville, O | “ | “ | Lowell | 6 “ |
| Isaac C. Hawkins, Clarksville, O | “ | “ | Tom | 6 “ |
| T. G. White, Centreville, O | “ | “ | | 6 “ |
| B. Ramsey, Centreville, O | “ | “ | | 10 “ |
| D. H. Dryden, Dayton, O | “ | “ | | 8 “ |
| J. H. Stansell, Centreville, O | “ | “ | | |
| W. C. Davis, Dayton, O | “ | “ | Sam | 6 “ |
| Abner Harris, Centreville, O | “ | “ | Charley | 7 “ |
| A. C. Jennings, Urbana, O | “ | “ | Gray Ike | 7 “ |
| Evans & Perrine, Lebanon, O | “ | “ | George | 4 “ |
| W. R. Kent, Dayton, O | “ | “ | | 6 “ |
| J. D. Phillips, “ | “ | “ | | 11 “ |
| T. V. Doup, “ | “ | “ | Major | 6 “ |
| R. Nevins, Columbus, O | “ | “ | Jack Rossiter | 4 “ |
| T. V. Shertzer, Franklin, O | “ | “ | | 4 “ |
| Emanuel Hawker, Dayton, O | “ | mare | Fanny Gale | 4 “ |
| Wm. Stansell, Centreville, O | “ | “ | Topsey | 6 “ |
| Howard & Van Meter, Woodstock, O | “ | “ | Paragon | 5 “ |
| “ “ “ | “ | “ | Lute | 5 “ |
| J. S. Sharp, Worthington, O | “ | “ | Lady Jane | 6 “ |
| Henry Ten Eyk, Hyattsville, O | “ | “ | Flora | 6 “ |
| J. C. Hawkins, Clarksville, O | “ | “ | Kate | 6 “ |
| Geo. W. Geran, Blue Ball, O | “ | “ | Montezuma | 4 “ |
| Jos. Loy, Centreville, O | “ | “ | Polly | 4 “ |
| J. Johnson, Vandalia, O | “ | “ | | 5 “ |
| J. H. Stansell, Centreville, O | “ | “ | | |
| J. A. Johnson, Urbana, O | “ | “ | | 8 “ |
| G. Swartz, Dayton, O | “ | “ | | 5 “ |
| W. H. Hopping & Bro., New Jasper, O. | “ | “ | Morgan | 4 “ |
| James Barton, Columbus, O | “ | “ | | 6 “ |
| Otho Evans, Franklin, O | “ | “ | Queen | 7 “ |
| J. Alexander, Jamestown, O | Saddle | stallion | Bluffer | 8 “ |
| “ “ | “ | “ | Dawler | 7 “ |
| R. H. Burgdill, “ | “ | “ | Tom Hall | 5 “ |
| Wm. D. Mason, West Jefferson, O | “ | gelding | Millard Fillmore. | 5 “ |
| J. C. Wilson, Dayton, O | “ | “ | Jim | 9 “ |
| W. C. Hankinson, Franklin, O | “ | “ | Bellfounder | 3 “ |
| John Enoch, jr., West Liberty, O | “ | “ | White Stockings. | 10 “ |
| A. A. Schenck, Franklin, O | “ | “ | Sam Hazzard | 4 “ |
| “ “ | “ | “ | Prince | 5 “ |
| —— Rolf, Springfield, O | “ | “ | Wild Will | 5 “ |

| | | | | |
|---|---|---|---|---|
| Jas. Alexander, Jamestown, O | Saddle | gelding | Byram | 6 ys. |
| R. H. Burgdill, “ | “ | “ | Tom Hall | 5 “ |
| G. H. Dean, Xenia, O | “ | “ | Frank | 4 “ |
| J. W. Porter, Greenville, O | “ | “ | | 8 “ |
| W. P. James, Centreville, O | “ | “ | | 5 “ |
| J. Patterson, Dayton, O | “ | “ | Civil John | 8 “ |
| W. D. Mason, West Jefferson, O | “ | mare | Katy Darling | 5 “ |
| J. T. Warder, Springfield, O | “ | “ | Nellie | 5 “ |
| F. A. Brock, Selma, O | “ | “ | Clara | 6 “ |
| Joshua Brown, Jamestown, O | “ | “ | Bill | 4 “ |
| Howard & Van Meter, Woodstock, O | “ | “ | Jenny | 5 “ |
| “ “ “ | “ | “ | Paragon | 5 “ |
| “ “ “ | “ | “ | Lute | 5 “ |
| John Hutcheson, Xenia, O | “ | “ | | 5 “ |
| Jas. Hopkins, Bellebrook, O | “ | “ | Belle | 6 “ |
| Wm. Reed, Monroe, O | “ | “ | Pocahontas | 6 “ |
| P. Lutton, New Jasper, O | “ | “ | Julia | 4 “ |
| R. L. Vanharlingen, Lebanon, O | “ | “ | Kit | 6 “ |
| S. G. Turner, Grand Rapids, Mich | Trotting | stallion | Washtenaw Chief | 11 “ |
| L. D. Woodmansee, Hamilton, O | “ | “ | Tom Rolf | 6 “ |
| D. P. Egbert, Lebanon, O | “ | “ | Wagner | 6 “ |
| R. Nevins, Columbus, O | “ | “ | Joe Godwin | |
| J. Alexander, Jamestown, O | “ | “ | Reuben | 8 “ |
| W. D. Mason, West Jefferson, O | “ | mare | Lady Putnam | 6 “ |
| B. D. Woodmansee, Hamilton, O | “ | gelding | Grit | 12 “ |
| T. Phelps, Blendon, O | “ | mare | Lady Washington | 6 “ |
| G. Swartz, Dayton, O | “ | “ | | 6 “ |
| R. Nevins, Columbus, O | “ | gelding | Jack Rossiter | 4 “ |
| G. W. Ensley, Dayton, O | “ | “ | Apperton | 7 “ |

SWEEPSTAKES.

| | | |
|---|---|---|
| Z. Brown, Darrtown, O | 5 colts, sired by | Perfection. |
| R. H. Burgdill, Jamestown, O | “ “ | Young Highlander. |
| Abner Jennings, Urbana, O | Stallion | St. Lawrence. |
| Jacob J. Tiffy, Harshmansville, O | “ | Plowboy Morgan. |
| Z. Brown, Darrtown, O | “ | Highlander. |
| “ “ | “ | Perfection. |
| P. Vinnidge, Hamilton, O | “ | Belmont. |
| W. C. Davis, Dayton, O | “ | Iron Duke. |
| “ “ | “ | Nut Wood. |
| “ “ | “ | Tom Salter. |
| W. Beals & Co., McLaughlin's Stat'n, Pa | “ | England's Glory. |
| Geo. C. Webber, Hinkley, O | “ | Eastman Morgan. |
| Wm. Swailes, Troy, O | “ | Young Monarch. |

| | | |
|---|---|---|
| Sam. Alexander, Jamestown, O | Stallion | Boston. |
| E. S. Kilbourne, Sidney, O | “ | Black Warrior. |
| F. A. Bolser, Carthage, O | “ | Young America. |
| “ “ | “ | Young Perfection. |
| D. G. Lee, Hamilton, O | “ | Membrino. |
| S. G. Turner, Grand Rapids, Mich | “ | Washtenaw Chief. |
| Wm. Reed, Monroe, O | “ | Perfection. |
| J. F. Covault, Troy, O | “ | Morgan. |
| T. Phelps, Blendon, O | “ | Young Telescope. |
| Seven Mile Stock Co., Seven Mile, O | “ | Victor. |
| J. McKee, “ | “ | Bombon. |
| R. C. Stewart, Seven Mile, O | “ | Butler. |
| Thos. Hagan, “ | “ | Bellefounder. |
| G. D. Shields, Jr., Paddy's Run, O | “ | Black Aleck. |
| G. D. Shields, “ | “ | Butler Boy. |
| L. D. Woodmansee, Hamilton, O | “ | Tom Rolf. |
| Reber & Kutz, Lancaster, O | “ | Dangerous. |
| J. C. Hoffman, Germantown, O | “ | Morgan. |
| J. P. Mumma, Dayton, O | “ | Sampson. |
| John Sutphin, Middletown, O | “ | Ed. Forrest. |
| Richard Nevins, Columbus, O | “ | Joe Godwin. |
| J. C. Vance, Urbana, O | “ | Fearnought. |
| J. C. Wilson, Dayton, O | Mare | Nan. |
| “ “ | “ | Fan. |
| John Hines, “ | “ | Jenny. |
| Jacob Paff, Alexanderville, O | “ | Lize. |
| J. S. Rarey, Groveport, O | “ | Lady Thetis. |
| A. F. Hipp, St. Marys, O | “ | Kitty Clyde. |
| John Shroyer, New Carlisle, O | “ | Nellie. |
| W. H. Hopping & Bro., New Jasper, O. | “ | Hatty Till. |
| Jacob Carr, Washington, O | “ | Lady Scott. |
| Wm. Swailes, Troy, O | “ | Mary. |
| D. P. Larkin, Selma, O | “ | Brood mare. |
| R. H. Burgdill, Jamestown, O | “ | “ |
| J. A. Johnston, Urbana, O | “ | Miss Mattie. |
| P. Phelps, Blendon, O | “ | Lady Washington. |
| R. C. Stewart, Seven Mile, O | “ | Soco. |
| J. M. Stewart, “ | “ | Bay Highlander. |
| W. C. Stewart, “ | “ | Jenny Lind. |
| R. C. Stewart, “ | “ | Flora Duncan. |
| F. A. Brock, Selma, O | “ | Clara. |
| D. P. Larkin, “ | “ | Jane. |
| H. McClure, Bellbrook, O | “ | Betsy Hercules. |

| | | |
|---|---|---|
| S. Eldridge, Lebanon, O | Mare | Eliza Logan. |
| Evans & Perrine, Lebanon, O | " | Jen. |
| W. J. McFeeley, Columbus, O | " | Gusta. |
| E. Soward, Bellebrook, O | " | Nancy Boxer. |
| W. H. Hopping & Bro., New Jasper, O. | " | Annie Laurie. |
| Robert Way, New Jasper, O | " | Isabella. |

### JACKS AND MULES.

| | |
|---|---|
| N. Smith, Troy, O | Jack Castillian, 6 years. |
| W. C Davis, Dayton, O | " 3 years. |
| Jesse Parsons, Alexanderville, O | " Bob, 2 years. |
| W. C. Davis, Dayton, O | " 2 years. |
| " " | " 1 year. |
| C. Clagget, Xenia, O | " colt, 3 months. |
| " " | Jennet Martha, 4 years. |
| W. C. Davis, Dayton, O | " 3 years. |
| " " | " 2 years. |
| " " | " 1 year. |
| D. W. Holdeman, Vandalia, O | Pair of mules, Jack and Saul, 3 years. |
| W. Stansell, Centreville, O | " " Jim and Jerry, 5 years. |
| W. Haines, Dayton, O | " " Dave and John, 3 years. |
| " " | Single mule, Dave, 5 years. |
| W. H. H. Bristol, London, O | Pair of mules, Fanny & Jenny, 2 & 3 yrs. |
| John Wildeman, Selma, O | " " 1 year. |
| A. S. Sanders, Carrtown, O | " " 6 and 8 years. |
| C. Clagget, Xenia, O | Pair sucking mule colts. |

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## NO. OF ENTRIES IN THE CLASSES AND DEPARTMENTS.

### FIRST DEPARTMENT.

| | |
|---|---|
| Saxon sheep | 24 |
| Merinoes and grades | 24 |
| Silesians | 18 |
| Long wool | 20 |
| Southdown 13, and Cashmere goats 6 | 19 |
| Swine, large breeds | 37 |
| " small " | 20 |
| " sweepstakes | 14 |
| Poultry | 20 |

### SECOND DEPARTMENT.

| | |
|---|---|
| Machinery, engines, etc | 15 |
| Agricultural machines—1st division | 50 |
| “ “ 2d “ | 59 |
| “ “ 3d “ | 27 |
| Tools and household implements | 28 |
| Plows | 20 |
| Vehicles | 17 |
| Household implements, knitting and sewing machines | 14 |

### THIRD DEPARTMENT.

| | |
|---|---|
| Silks and mill fabrics | 20 |
| Needle, shell, and wax work | 98 |
| Household fabrics | 53 |
| Worked metals | 11 |
| Stoves, castings, etc | 25 |
| Cabinet ware | 19 |
| Coopers' and carpenters' ware | 16 |
| Saddlers' and shoemakers' ware | 21 |
| Chemicals | 7 |
| Philosophical and surgical instruments | 9 |
| Glass, crockery, stone-ware, etc | 5 |

### FOURTH DEPARTMENT.

| | |
|---|---|
| Field crops | 2 |
| Flour and grain | 52 |
| Butter, bread, etc | 35 |
| Cheese | 3 |
| Honey, sugar, preserves, etc | 198 |
| Vegetables, roots, etc | 44 |

### FIFTH DEPARTMENT.

| | |
|---|---|
| Flowers, professional list | 59 |
| “ amateur list | 42 |
| Apples | 6 |
| Peaches, pears, plums, etc | 73 |
| Grapes | 21 |

### SIXTH DEPARTMENT.

| | |
|---|---|
| Painting, drawing, etc | 30 |
| Musical instruments | 3 |

# REPORTS OF COMMITTEES AND AWARDS OF PREMIUMS AT THE TWELFTH OHIO STATE FAIR,

*Held at Dayton, September* 10*th to* 13*th*, 1861.

## CATTLE.

### SHORTHORNS.

| | |
|---|---|
| Best bull, 3 years and over, George M. Coulter, Reesville | $50 |
| Second best bull, 3 years and over, W. R. Dunlap, Xenia | 30 |
| Best bull, 2 years and under 3, D. McMillan, Jr., Xenia | 30 |
| Second best bull, 2 years and under 3, Alfred Coulter, Reesville | 20 |
| Best bull, 1 year and under 2, Z. Vesey, Reynoldsburg | 25 |
| Best bull calf, D. McMillan, Xenia | 10 |
| Best cow, 3 years and over, C. M. Clark, Springfield | 50 |
| Second best cow, 3 years and over, D. McMillan, Jr., Xenia | 30 |
| Best cow, 2 years and under 3, D. McMillan, Jr., Xenia | 30 |
| Second best cow, 2 years and under 3, C. M. Clark, Springfield | 20 |
| Best heifer, 1 year and under 2, C. M. Clark, Springfield | 25 |
| Second best heifer, 1 year and under 2, C. M. Clark, Springfield | 15 |
| Best heifer calf, D. McMillan, Jr., Xenia | 10 |
| Second best heifer calf, D. McMillan, Jr., Xenia | 5 |

*Report of Committee on Shorthorns.*

The number of animals exhibited was not large, but of superior quality. We hold that it is useless for the Board to restrict as to the feeding, for no judge can tell what a thin Durham will become when fattened, as the fat may go on in the wrong place, or in patches.

J. O. B. Renick,
T. V. Reber,
A. P. Howard.

### DEVONS.

| | |
|---|---|
| Best bull, 3—4 years, E. Matchem, Pittsfield | $20 |
| " cow, " " " | 20 |
| " calf, " " " | 8 |

No report on Devons.

### WORK OXEN AND STEERS.

| | |
|---|---|
| Best yoke of oxen, 4—5 years, Wm. Brock, Grape Grove | $25 |
| Second best yoke of oxen, 4—5 years, Wm. Palmer, Bloomington | 15 |

### FAT CATTLE.

| | |
|---|---|
| Best single bullock, 4—5 years, J. Enoch, Jr., West Liberty | $30 |
| Second best single bullock, 4—5 years, J. Enoch, Jr , West Liberty | 20 |
| Best single bullock, 3—4 years, F. A. Brock, Grape Grove | 20 |

### SWEEPSTAKES ON CATTLE.

| | |
|---|---|
| Best herd of bull and 4 cows, D. McMillan, Jr., Xenia | $100 |

| | |
|---|---|
| Second best herd of bull and 4 cows, C. M. Clark, Springfield | $50 |
| Best bull and 5 of his calves not less than 1 year, W. Palmer, Bloomington, | 60 |
| Best bull of any age, Z. Vesey, Reynoldsburg | 50 |
| Best cow of any age, D. McMillan, Jr., Xenia | 50 |

### *Report of Committee on Work Oxen, Steers, Fat Cattle and Milch Cows.*

Your committee on work oxen, steers, fat cattle and milch cows beg leave to report that the entries for their examination were quite limited, but mostly of superior quality. The two yoke of oxen to which we awarded premiums were fine-styled cattle, but, in the judgment of part of your committee, were too fleshy for working purposes.

The premium bullocks were fine specimens of fat cattle, thoroughly fed. The statement furnished by exhibiter is not as satisfactory as we could desire. It should state the increased weight during the several periods of stall-feeding and grazing.

T. F. Joy,
Z. Vesey,
R. D. Pettitt.

| | |
|---|---|
| Fed from 1st November to 10th May, 160 bushels corn, at 25 cents | $40 00 |
| Pasturing from 10th May to 1st August | 7 50 |
| From 1st August to 10th September, 35 bushels corn, at 25 cents | 8 75 |
| | $56 25 |

John Enoch, Jr.

## HORSES.

### THOROUGHBREDS.

| | |
|---|---|
| Best stallion, 4—5 years, J. C. Vance, Urbana | $50 |
| Second best stallion, 4—5 years, Hamilton & Seal, Bellbrook | 25 |
| Best stallion, 3—4 years, Samuel Alexander, Jamestown | 25 |
| Best stallion, 2—3 years, Reber & Kutz, Lancaster | 20 |
| Second best stallion, 2—3 years, Hamilton Wilson, Somerford | 10 |
| Best stallion, 1—2 years, “ “ | 15 |
| Best brood mare, 4—5 years, J. S. Barey, Groveport | 30 |
| Second best brood mare, 4—5 years, R. G. Corwin, Dayton | 20 |

### ROADSTERS.

| | |
|---|---|
| Best stallion, 4—5 years, Richard Nevins, Columbus | $50 |
| Second best stallion, 4—5 years, E. S. Kilbourne, Sidney | 25 |
| Best stallion, 3—4 years, L. D. Woodmansee, Hamilton | 25 |
| Second best stallion, 3—4 years, Martin Peterson, Xenia | 15 |
| Best stallion, 2—3 years, D. V. Pottle, Xenia | 20 |
| Second best stallion, 2—3 years, W. C. Davis, Dayton | 1 |
| Best brood mare, 4—5 years, S. Eldred, Lebanon | 30 |

| | |
|---|---|
| Second best brood mare, 4—5 years, W. D. Mason, West Jefferson | $20 |
| Best brood mare, 3—4 years, Evans & Perrine, Lebanon | 20 |
| Second best brood mare, 3—4 years, A. J. Ryan, West Jefferson | 15 |
| Best brood mare, 2—3 years, A. C. Jennings, Urbana | 15 |
| Second best brood mare, 2—3 years, A. C. Jennings, Urbana | 10 |
| Best filly, 1—2 years, D. P. Larkin, Selma | 10 |
| Second best filly, 1—2 years, Isaac Dinglet, Bellbrook | 5 |

### HORSES FOR GENERAL PURPOSES.

| | |
|---|---|
| Best stallion, 4—5 years, Wm. Reed, Monroe | $50 |
| Second best stallion, 4—5 years, Z. Brown, Darrtown | 25 |
| Best stallion, 3—4 years, M. P. Vinnedge, Hamilton | 25 |
| Second best stallion, 3—4 years, Z. Brown, Darrtown | 15 |
| Best stallion, 2—3 years, Isaac Smith, Eaton | 20 |
| Second best stallion, 2—3 years, B. D. Anderson, Xenia | 10 |
| Best stallion, 1—2 years, F. A. Balsar, Carthage | 15 |
| Second best stallion, 1—2 years, Wm. Reed, Monroe | 10 |
| Best sucking colt, John Shoup, Springfield | 10 |
| Second best sucking colt, R. H. Burgdill, Jamestown | 5 |
| Best brood mare, 4—5 years, R C. Stewart, Seven Mile | 30 |
| Second best brood mare, 4—5 years, D. P. Larkin, Selma | 20 |
| Best brood mare, 3—4 years, R. C. Stewart, Seven Mile | 20 |
| Second best brood mare, 3—4 years, J. C. Wilson, Dayton | 15 |
| Best brood mare, 2—3 years, D. H. Clemmer, Johnsville | 15 |
| Second best brood mare, 2—3 years, S. A. Anderson, Dayton | 10 |
| Best filly, 1—2 years, Z. Brown, Darrtown | 10 |
| Second best filly, 1—2 years, Wm. Prest, Middletown | 5 |
| Best sucking mare colt, John Shroyer, New Carlisle | 10 |
| Second best sucking mare colt, R. H. Burgdill, Jamestown | 5 |

[NOTE.—R. C. Stewart and W. C. Stewart had superior mare colts duly entered, which they designed exhibiting, but which were not before the committee from no fault of theirs.—KLIPPART.]

### DRAFT HORSES.

| | |
|---|---|
| Best stallion, 4—5 years, W. Beals & Co., McLaughlin, Pa. | $50 |
| Second best stallion, 4—5 years, J. R. Marshall, Xenia | 25 |
| Best stallion, 3—4 years, W. H. H. Bristol, West Jefferson | 25 |
| Second best stallion, 3—4 years, Emanuel Rudy, Troy | 15 |
| Best stallion, 2—3 years, James Marshall, Xenia | 20 |
| Second best stallion, 2—3 years, G. Farrington, Mechanicsburg | 10 |
| Best stallion, 1—2 years, Joseph Rudy, Hyattsville | 15 |
| Second best stallion, 1—2 years, J. R. Marshall, Xenia | |
| Best sucking colt, A. M. Townsley, Cedarville | 10 |
| Second best sucking colt, J. R. Marshall, Xenia | 5 |

| | |
|---|---|
| Best brood mare, 4—5 years, Wm. Bain, Xenia | $30 |
| Second best brood mare, 4—5 years, H. McClure, Bellbrook | 20 |
| Best brood mare, 3—4 years, T. Robinson, New California | 20 |
| Best brood mare, 2—3 years, G. Farrington, Mechanicsburg | 15 |
| Second best brood mare, 2—3 years, Harvey Shields, Xenia | 10 |
| Best sucking mare colt, R. H. Burgdill, Jamestown | 10 |
| Second best sucking mare colt, R. H. Burgdill, Jamestown | 5 |

### MATCHED HORSES AND MARES.

| | |
|---|---|
| Best pair matched roadsters, W. R. Ayres, Dayton | $25 |
| Best pair coach horses, J. Egbert, Lebanon | 25 |
| Best pair farm or draft horses, J. Beard, Darby Creek | 25 |

### GELDINGS AND MARES FOR SADDLE AND HARNESS.

| | |
|---|---|
| Best gelding for harness, 4—5 years, L. D. Woodmansee, Hamilton | $20 |
| Second best gelding for harness, 4—5 years, R. Nevins, Columbus | 10 |
| Best mare for harness, 4—5 years, J. A. Johnson, Urbana | 20 |
| Second best mare for harness, 4—5 years, J. S. Sharp, Worthington | 10 |
| Best gelding for saddle, 4—5 years, G. H. Dean, Xenia | 20 |
| Second best gelding for saddle, 4—5 years, W. D. Mason, West Jefferson | 10 |
| Best mare for saddle, 4—5 years, Howard & Van Metre, Woodstock | 20 |
| Second best mare for saddle, 4—5 years, J. T. Warder, Springfield | 10 |

### TROTTERS.

| | |
|---|---|
| Best and fastest trotting stallion, L. D. Woodmansee, Hamilton | Silv. med. |
| Best and fastest trotting mare, R. Nevins, Columbus | " |
| Best saddle stallion, J. Alexander, Jamestown | $20 |
| Second best saddle stallion, J. Alexander, Jamestown | 10 |

### SWEEPSTAKES ON COLTS.

| | |
|---|---|
| Best 5 colts, 3 years and under, by same sire, Z. Brown, Darrtown | $40 |
| "Perfection," sire of above 5 colts | Silv. med. |
| Second best 5 colts, 3 years and under, by same sire, R. H. Burgdill, Jamestown | $20 |
| "Highlander," sire of above 5 colts | Silv. med. |

### SWEEPSTAKES ON HORSES.

| | |
|---|---|
| Best stallion of any age or breed, L. D. Woodmansee, Hamilton | $100 |
| Best mare of any age or breed, J. M. Stewart, Seven Mile | 100 |

### JACKS AND MULES.

| | |
|---|---|
| Best jack, 3—4 years, N. Smith, Troy | $25 |
| Best jack, 2—3 years, W. C. Davis, Dayton | 15 |
| Best jack, 1—2 years, " " | 10 |
| Best jennet, 3—4 years, C. Cleggett, Xenia | 15 |

| | |
|---|---|
| Best jennet, 2—3 years, W. C. Davis, Dayton | $10 |
| Best jennet, 1—2 years, " " | 5 |
| Best pair of mu'es, 2—3 years, D. D. Holderman, Vandalia | 15 |
| Best mule colt, C. Cleggett, Xenia | 5 |
| Best pair of yearling mules, John Williams, Selma | Com. |

No reports of committees on any of these classes.

## SHEEP.

### SAXONS AND GRADES.

| | |
|---|---|
| Best buck over 2 years, John Singer, New Athens | $20 |
| Second best buck over 2 years, H. J. Starr, Carey | 10 |
| Best buck under 2 years, " " | 20 |
| Second best buck under 2 years, John Singer, New Athens | 10 |
| Best pen of 5 ewes, 2 years and over, " " | 20 |
| Second best pen of 5 ewes, 2 years and over, H. J. Starr, Carey | 10 |
| Best pen of 5 ewes under 2 years, C. M. Carr, Carey | 20 |
| Second best pen of 5 ewes under 2 years, J. Singer, New Athens | 10 |
| Best pen of 5 lambs, J. Singer, New Athens | 15 |
| Second best pen of 5 lambs, H. J. Starr, Carey | 10 |
| Best fleece of Saxony wool, " " | 2 |

### SILESIANS AND GRADES.

| | |
|---|---|
| Best buck over 2 years, J. Singer, New Athens | $20 |
| Second best buck over 2 years, H. J. Starr, Carey | 10 |
| Best buck under 2 years, " " | 20 |
| Second best buck under 2 years, John Singer, New Athens | 10 |
| Best pen of 5 ewes over 2 years, " " | 20 |
| Second best pen of 5 ewes over 2 years, H J. Starr, Carey | 10 |
| Best pen of 5 lambs, " " | 10 |
| Best fleece of Silesian wool, " " | 2 |

### MERINOS AND GRADES.

| | |
|---|---|
| Best buck over 2 years, W. Eagleson, Cold Spring | $20 |
| Second best buck over 2 years, Isaac Fulton, Sidney | 10 |
| Best buck under 2 years, " " | 20 |
| Second best buck under 2 years, W. Eagleson, Cold Spring | 10 |
| Best pen of 5 ewes under 2 years, " " | 20 |
| Second best pen of 5 ewes under 2 years, Isaac Fulton, Sidney | 10 |
| Best pen of 5 lambs, W. Eagleson, Cold Spring | 15 |
| Second best pen of 5 lambs, Isaac Fulton, Sidney | 10 |

### LONG WOOL SHEEP.

| | |
|---|---|
| Best buck, over 2 years, N. S. Townshend, Avon | $20 |
| Second best buck, over 2 years, W. Beals & Co., McLaughlin, Pa. | 10 |

| | |
|---|---|
| Best buck, under 2 years, W. Matthews, Etna | $20 |
| Second best buck, under 2 years, Chas. C. Polley, Abingdon, Indiana | 10 |
| Best pen of 5 ewes, over 2 years “ “ | 20 |
| “ 5 ewes, under 2 years, J. Chamberlain, Avon | 20 |
| “ 5 lambs, Wm. Matthews, Etna | 15 |
| Second best pen of 5 lambs, Wm. Matthews, Etna | 10 |
| Best fleece of long wool, Thomas Bushnell, Haysville | 2 |

### *Report of Committee on Long Wool Sheep.*

The undersigned committee, appointed to examine and report on the stock entered in this class, have performed the duties assigned us, and find the show of sheep in this department rather meagre in quantity, yet there were some fine animals. We have attached opposite to their names and numbers our awards, by affixing first and second premiums.

A. E. Strickle,
Robt. Brown,
John Turnbull.

### SOUTH DOWNS.

| | |
|---|---|
| Best buck, over 2 years, Saml. Toms, Elyria | $20 |
| Best buck, 1—2 years “ “ | 20 |
| Best pen of aged ewes “ “ | 20 |
| “ of ewes, 1—2 years “ “ | 20 |
| “ of lambs “ “ | 15 |

### FAT SHEEP.

| | |
|---|---|
| Best pen of 5 fat sheep, Chas. C. Polley, Abingdon, Indiana | $15 |
| Best single fat sheep “ “ | 5 |

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### CASHMERE GOATS.

Best aged buck, S. S. Williams, Granville.
“ buck, 1 year, S. S. Williams, Granville.
“ buck, under 1 year “ “
Second best buck “ “ “
“ ewe, 2—3 years “ “
“ ewe, 1—2 years “ “
“ ewe, under 1 year “ “

See proceedings of State Board, page 5.

Wool from “*Sultana,*” first premium; ewe of 1860.

### *Report of Committee on Cashmere Goats.*

Imported buck, John Bell. Imported in 1859, by Mr. W. H. Stiles, of Georgia, from Turkey in Asia, and purchased by S. S. Williams, at a cost of $1,000. This buck is six years old, and was shorn last spring of 6 lbs. of marketable wool, at $8 per lb. His weight is at present (and we find him in average flesh) 185 lbs. The general appearance of the animal for hardiness we consider superior to any of the species heretofore seen by us. Next we find two 1 year old bucks, Sampson and Napoleon. Sampson was sired by John Bell, dam, imported Victoria. He clipped 4 lbs of clean, nice wool of a very superior quality, which was taken off on the 21st of May. We find the wool on him at present five and a half inches long, which, in our judgment, is well worthy of the first premium. Napoleon we found to be a longer framed animal. He was sired by Stiles' Buck of Georgia, imported. His dam was imported Sultana, who has been a winning animal at the State and United States fairs heretofore. Napoleon's weight at present is 110 lbs., and we award him the second premium. The most remarkable thing we find about these animals is the extraordinary length of their ears, which we find to be eight inches long. We also find the imported ewe, Victoria, a very superior animal in our judgment. Her weight is said to be 100 lbs. Her clip this season was 4½ lbs., and the grade of wool we find to be like that of sheep, the female wool finer than the male. Her age is five years, and we award her the first premium.

Next we come to the grades, three in number. Ada being 15–16, at nine months old weighed 30 lbs., and her clip was 3 lbs., which is said to be equal if not superior to the thoroughbreds. The other two, Lizzie and Molly, three-quarter blood, one year old, which plainly show their cross in every respect, the committee are of opinion that these animals should be highly recommended to the favorable consideration of all that class of breeders, and the whole public.

THOS. C. DYE,
B. LEWIS,
A. W. LIVINGSTON.

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## SWINE.

### LARGE BREEDS.

| | |
|---|---|
| Best boar, 2—3 years, A. Caton, Cardington | $20 |
| Second best boar, 2—3 years, J. H. Perrine, Lebanon | 10 |
| Best boar, 1—2 years, J. P. Mumma, Dayton | 15 |
| Second best, 1—2 years, John Hines, Dayton | 10 |
| Best boar, under 1 year, E. & B. Bassett, Milan | 10 |
| Second best boar, under 1 year, J. H. Perrine, Lebanon | 5 |
| Best breeding sow, over 2 years, J. C. Watkins, Centreville | 20 |
| Second best breeding sow, over 2 years, E. Newcome, Dayton | 10 |
| Best breeding sow, 1—2 years, A. Caton, Cardington | 15 |
| Second best breeding sow, 1—2 years, A. Caton, Cardington | 5 |
| Best 5 pigs of same litter, J. C. Watkins, Centreville | 15 |
| Second best 5 pigs of same litter, J. P. Mumma, Dayton | 5 |
| Best sow pig, under 1 year, E. & B. Basset, Milan. | |
| Second best sow pig, under 1 year, Henry Grindle, Fairfield. | |

### *Report of Committee on Large Breeds.*

Thirty-five entries in class I; number of animals in competition sixty. Your committee, in making their awards, have kept in view the following points: purity of stock, symmetry of carcass, constitution, and general capacity to take on fat. The competition between boars over two years old was confined to six animals. In one shown by Andrew Caton, of Cardington, Ohio, your committee found the following points well represented: Purity of (Leicester) stock, breadth and depth across the shoulders, length and roundness of body, fullness of ham, dropping well down in the hock and running up the back, so that the length and width of ham were unusually good, with nice, clean head and ear—points taken altogether, in our opinion, would cause early maturity with as little feed as it is possible to grow a hog of large size. With the exception of this one, all the rest were too fat, looking more like hogs fattened for the knife, than ones kept for breeding purposes. In reference to them, the committee came to three conclusions: first—fat enough to slaughter; second—so fat that they were of no account for breeding purposes; third—amount of corn, mush and milk fed, unknown. The exhibit of aged sows was good, showing all the points that go to make up a hog of large size in great perfection. One exhibited by John C. Watkins, of Centreville, Ohio, a cross between the Poland and Berkshire, combined the greatest number of good qualities. Your committee, by careful inquiry and investigation, have come to the conclusion that among all the breeds there is no one that sustains its own type so well as the Poland, when crossed with other breeds, showing a force almost sufficient to Polandise any of the other breeds when crossed with them. Sows over one year old, four entries. Andrew Caton, with his pure blood "Leicester's," took the first and second premiums in this class. Both of his sows had a litter of pigs on exhibition, which in every particular represented the true type of the Leicester stock. We take pleasure in recommending to breeders who like this Leicester stock, a careful examination of his hogs.

In conclusion, we would suggest to breeders the propriety of keeping the different breeds pure, which will enable them to depend, certain, upon what kind of hogs they will have; for, in our opinion, if there was any one feature that had prominence, it was, that where the different stocks had been crossed there was no true type of either breed, but very often exhibiting the imperfections of all, especially when they had reached the third or fourth cross. We are of the opinion that the Leicester, Poland, Chester White, or Berkshire, are any one of them a better hog when kept pure than when crossed with each other.

W. B. McLung.

#### SUFFOLK AND SMALL BREEDS.

| | |
|---|---|
| Best boar, 1—2 years, J. B. Gates, Hope | $15 |
| Second best boar, 1—2 years. J. B. Gates, Hope | 10 |
| Best breeding sow, over 2 years, E. Newcome, Dayton | 20 |
| " " 1—2 years, E. & B. Bassett, Milan | 15 |

| | |
|---|---|
| Best breeding sow, ½ year E. & B. Bassett, Milan | $10 |
| Best 5 pigs of same litter, J. B. Gates, Hope | 10 |

### SWEEPSTAKES ON SWINE.

| | |
|---|---|
| Best boar of any age or breed, J. H. Perrine, Lebanon | $20 |
| Best sow “ Henry Warren, Fairfield | 20 |
| Best boar “ J. B. Gates, Hope | Commended. |

### *Report of Committee on Small Breeds.*

1st. Boar, 2 years. First premium to J. B. Gates. Single entry, and worthy of commendation. 2d. T. G. White. Only one entry; not deemed worthy of premium. 3d. Four entries. Premium awarded to J. B. Gates, as being the most hardy growth and best proportioned, good feeders, &c.

Sows over 2 years, one entry, E. Newcome. Large, smooth sow. First premium. Sows over one year, one entry, Suffolk. Good, easy feeder, &c. First Premium. Sows under one year, three entries. Premium to E. & B. Bassett. Nice, smooth pig, easy feeder, good for lard; small offing. Pigs, three entries. Premium to J. B. Gates. Fatten at any age.

A. E. Sprague.

### POULTRY.

| | |
|---|---|
| Best pair of game fowls, A. H. Hipp, St. Marys | $3 |
| 2d “ “ Jefferson Patterson, Dayton | 2 |
| Best “ Spanish fowls, E. & B. Bassett, Milan | 3 |
| “ turkeys, Jonah Bull, Dayton | 3 |
| 2d “ “ D. Garst, Dayton | 2 |
| Best “ geese, Henry Firestine, Dayton | 3 |
| 2d “ “ Jonah Bull, Dayton | 2 |
| Best 6 varieties pigeons, P. Hellrigle, Dayton | 5 |
| 6 “ birds, “ “ | 5 |
| exhibition of poultry, E. & B. Bassett, Milan | 10 |
| Muscovy duck, P. Hellrigle, Dayton | Com. |
| Poland “ Thos. Bushnell, Hayesville | “ |

## SECOND DEPARTMENT.

### MACHINERY, ENGINES, ETC.

| | |
|---|---|
| Best portable steam engine, Owens, Lane & Dyer, Hamilton | |
| “ “ saw mill, “ “ “ | 20 |
| “ shingle machine, E. Fairchild, Cleveland | 5 |
| “ morticing “ H. Smith, Clarksville | 5 |
| “ tenoning “ Geo. Taylor, Worthington | — |
| “ scroll sawing machine, C. W. Griffith, Dayton | 5 |
| “ water wheel, Stout, Mills & Temple, Middletown | 5 |

### AGRICULTURAL MACHINES.

*(First Division.)*

| | |
|---|---|
| Best thrashing Machine, Rouse & Clark, Piqua | $15 |
| " sweep horse power, F. W. Robinson, Richmond, Ind | 10 |
| " endless chain power, Lagonda Works, Springfield | 5 |
| " threshing machine operated by endless chain, Lagonda works, Springfield | 5 |
| " clover seed hulling machine, Birdsall & Brokaw, West Henrietta, N. Y. | 5 |
| " power corn sheller, Lagonda Works, Springfield | 3 |
| " hand " E E. Smith, Union | 2 |
| " sorgho mill, J. L. Gill & Son, Columbus | 5 |
| " " evaporator, L. Woodhull, Dayton | 10 |
| " cider mill and press, " " | 5 |
| " hay press, " " | 5 |
| " horse hay rake, Samuel Rohrer, " | 3 |
| " hay, straw and stalk cutter, Baldwin, Dewitt & Co., Cleveland | 5 |
| " clover huller, O'Ferrall, Daniels & Co., Piqua | Dip. |

The original committee being unable to agree on sorgho evaporators, a special committee was appointed, who reported as follows, but made the award as above stated:

*Report of Committee on Sorgho Evaporators.*

The committee feel in great hopes that exhibiters in this class will in future trials afford still better evidence of the capacity of their apparatus for producing sugar from the sorgho plant.

JOSEPH E. HOLMES,
J. J. LOW,
J. WESTERMAN.

### AGRICULTURAL MACHINES.

*(Second Division.)*

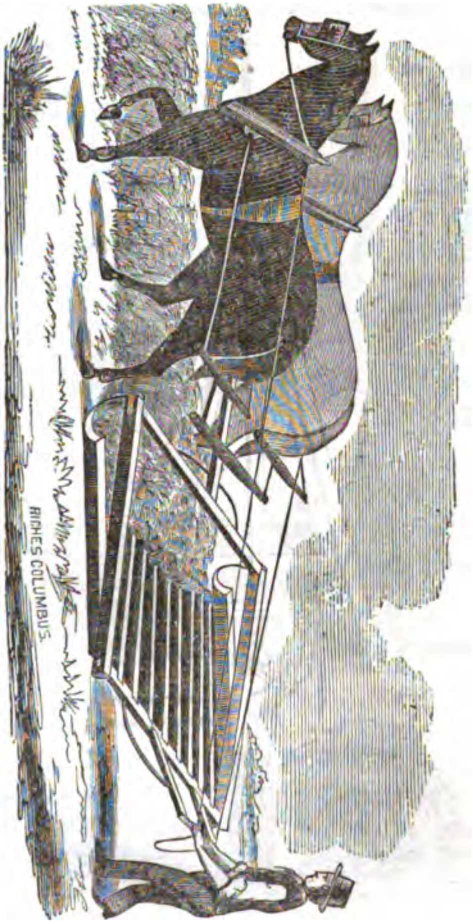
| | |
|---|---|
| Best 2 horse wheat drill, Smith, Barnes & Co., Tiffin | $10 |
| 2d " " Baldwin, Dewitt & Co., Cleveland | 5 |
| Best 1 horse wheat drill, Pritz & Kuhns, Dayton | 5 |
| Broadcast sowing machine, T. Marsh & Co., Springfield | 5 |
| Machine for cutting and shocking corn, W. C. Hall, Newark | 5 |
| Reaping machine, Whitely, Fassler & Kelly, Springfield | 5 |
| Mowing " " " " | 5 |
| Combined reaper and mower, Long, Black & Allstatter, Hamilton | 5 |
| Hay pitching machine, J. L. Mansfield, Clockville, N. Y | 3 |
| Corn planter, (horse power), Bomberger & Wright, Dayton | 5 |
| Field roller and crusher, Lagonda Works, Springfield | 5 |
| Corn cultivator, " " " | 2 |

### *Report of Committee on Agricultural Machines.*

Your committee would report that they found a very good display of agricultural machines connected with their department. Especially was this the case in regard to reaping and mowing machines. We found it very difficult to determine the superiority. Those machines, to which we did not award premiums, need not consider it any disparagement. The committee would cheerfully recommend them to a generous public.

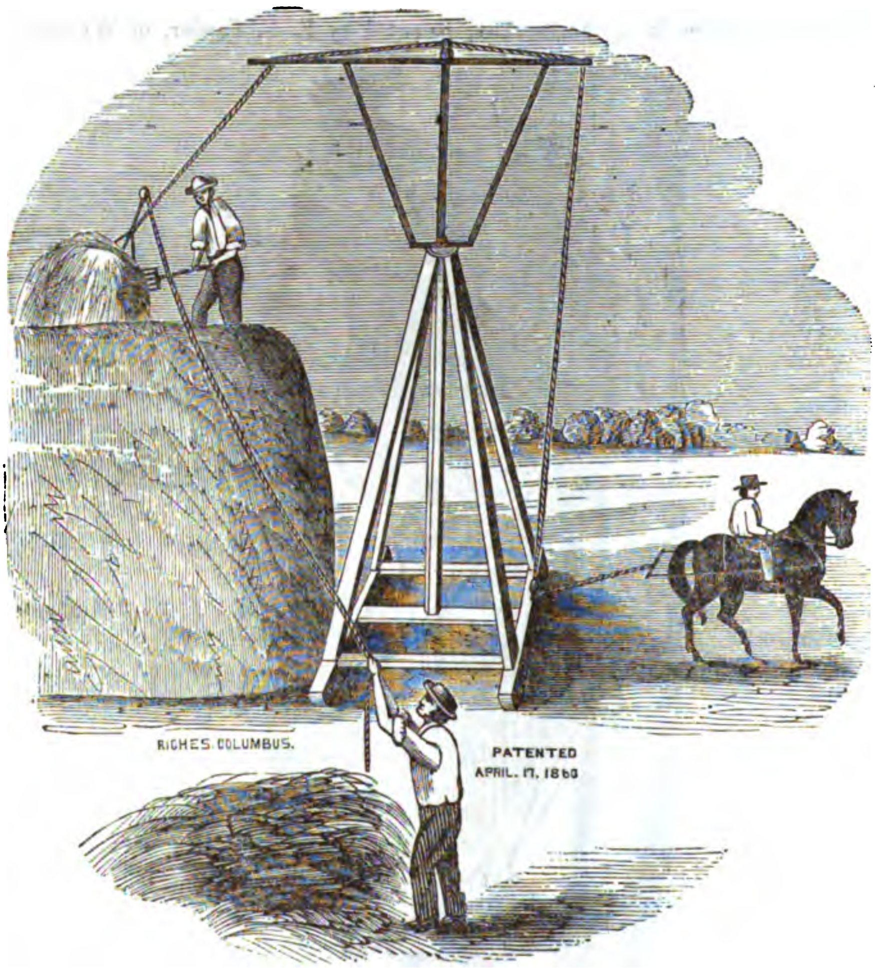
Turgus Anderson,
John McElroy,
J. A. Carter.

A new machine for gathering hay, patented by F. F. Fowler, of Wyandot county, was exhibited, on which the board awarded a premium at the January meeting. (See proceedings of State Board, page 5.)


RICHES COLUMBUS.

The machine, as the cut shows, is simple in its construction, and easy of management. Its practical utility has been thoroughly tested by the inventor and others who have used it.

As represented in this cut, it is just beginning to fill. The team goes lengthwise of the winnow, (one horse on each side of it) till the machine is filled, which holds from six to ten hundred pounds. Then drive to the stack and unload by raising the handles; the head and teeth and handles revolve over the hay, and the machine resumes its proper position for reloading. This is the whole process of working this very useful machine for hauling hay to the stack.



The cut shows the machine as it appears after the hay has been carried up and over to the outside of the stack. When the fork is placed in the hay on the ground, the upper part of the machine (which is rotary) turns half round, and, as the horse moves out, the hay is not only lifted up, but is at the same time carried around *over* the stack; and by the cross-beam extending *out over* the stack, and the swing of the rope, the stacker is enabled to have the hay deposited any place on the stack he wishes. After the hands have had a few hours' practice, they will not find the least trouble in placing the hay (with the machine) anywhere they please, on any sized stack or rick they may wish to build. This machine does not *drag* its load up *against* the stack, but lifts it clear from any obstruction, so that it touches nothing till it falls from the fork on the top of the stack. The same horse that lifts your hay, will move the machine from place to place and field to field, without taking it down. It has to be put up but once a year, and when you are through haying, it can be taken apart and put away in a small space in your barn or shed.

### AGRICULTURAL MACHINES.

(*Third Division*)

| | |
|---|---|
| Best portable grist mill, J. A. Foreman, Dayton | $5 |
| Best smut machine, J. H. Jones, do | 5 |
| Best farm feed mill, B. C. Taylor, do | 5 |
| Best fanning mill, John W. Free, Laporte, Ind | 3 |
| Best flour packing machine, Samuel Taggart, Dayton | 3 |
| Best brick machine, J. W. Penfield, Willoughby | 10 |
| Best drain tile do do do | 5 |
| Best bee hive, W. A. Flanders, Cleveland | 3 |

### TOOLS AND IMPLEMENTS.

| | |
|---|---|
| Best churn, Lagonda Works, Springfield | $3 |
| Best washing machine, J. B. Coffin, Ashland | 3 |
| Best clothes horse, J. McCannon, Dayton | 2 |
| Best cabbage cutter, Geo. Limbert, do | 2 |
| Best well pump, Robert Ogden, do | 3 |
| Best apparatus for raising water, W. H. Hayden & Co., Columbus | 2 |
| Best collection of agricutlural implements, Lagonda Works, Springfield | 25 |

### PLOWS.

| | |
|---|---|
| Best plow for general purposes, Lagonda Works, Springfield | $10 |
| Second best plow for general purposes, J. Augha, Dayton | 5 |
| Best sod plow, Lagonda Works, Springfield | 10 |
| Second best sod plow, Ira Reynolds, do | 5 |
| Best 1-horse plow, Fisher & Schofield, Alpha | 5 |
| Best mole plow, H. A. Ashley, Springfield | 10 |
| Best shuttle plow, Lagonda Works, Springfield | com. |
| Best single shovel plow, do do | do |

### VEHICLES.

| | |
|---|---|
| Best 2-horse family carriage, Langdon & Bros., Dayton | $10 |
| Second best do do do | 5 |

| | |
|---|---|
| Best 1-horse family carriage, Langdon & Bros., Dayton | $8 |
| Best top buggy, do do | 5 |
| Best trotting wagon, J. M. Walters & Bro., do | 3 |
| Best farm wagon for general purposes, Fisher & Schofield, Alpha | 5 |
| Best wagon brake, J. G. Wolf, Morristown, Ind | 2 |
| Best sleigh, Langdon & Bros., Dayton | 5 |
| Best display of carriage wheels, hubs, etc., Blanchard & Brown, Dayton | 5 |
| Best display of carriages and buggies, Langdon & Bros., Dayton | 20 |

## HOUSEHOLD MACHINES.

| | |
|---|---|
| Best knitting machine, Miss S. Bronson, Cincinnati | $5 |
| Best sewing machine for manufacturing purposes, Grover & Baker, Cincinnati | 5 |
| Best sewing machine for family use, Wm. Sumner & Co., Cincinnati | 5 |
| Best sewing machine for family use, not costing over $30, Wm. Sumner & Co., Cincinnati | 5 |

## *Report of Committee on Sewing Machines.*

The committee, acting under instructions, had three questions presented for their decision—

1st. The best sewing machines for family use.

2d. Best cheap machine for same purpose.

3d. Best machine for general manufacturing purposes.

The committee beg leave to state, they are aware that to make a decision which shall command general assent, actual use of the various machines, and a considerable knowledge of mechanics seem necessary.

Besides, the differences between the various machines are, in some cases, slight; each has its excellences and defects; and no one fulfills or perhaps can fulfill, all the conditions required in a perfect machine.

The machines thus far invented may be divided into two classes—*single* and *double thread* machines. The first class need not be noticed. The second may be subdivided into what should be called, 1st. The *Loop Stitch;* and, 2d. The *Lock Stitch.* The original Baker & Grover's is a good example of the first; Wheeler & Wilson's, and the shuttle machines, of the second. The loop stitch machines work easily and noiselessly, and are well adapted to a limited class of operations.

The committee are of opinion, however, that those machines will finally take precedence for general work which use two threads—an upper and lower—and make the stich alike on both sides of the cloth. The Wheeler and Wilson's, Sloat's, and the shuttle machines, all make this stitch, and in this respect they do not differ. The modes adopted in these machines for locking the threads together, and the mechanical arrangement and combination of parts for producing the vaious movements, constitute the main differences between them.

For family use, the committee award the prize to Wheeler & Wilson's machine, upon the following grounds: The *excellence* and *uniformity* of its *work*; the *simplicity* of its *structure*; *rapidity* of *execution*; and *ease* of *motion*. While for some kinds of sewing it may be excelled by others, yet for the general work pertaining to a household, we believe it better adapted, upon the whole, than any other machine.

In deciding the second question: "The *best cheap* machine for family use," we are compelled again to make the award in favor of Wheeler & Wilson's. While their second-class machines differ from the first class only in finish, not in sewing qualities, they are sold as low as any other.

In selecting a machine for manufacturing purposes, the committee meet with more difficulty, as they are all alike in this, that they have the shuttle movement.

The new machine of Grover & Baker, by a peculiar arrangement connected with the shuttle, avoids the *interrupted* motion of the needle arm, which has heretofore been found necessary in this class of machines. This is certainly an advantage which should give it preference over other shuttle machines; provided further use shows it equal to them in all other respects.

Their experience in its use thus far, favors their decision.

In conclusion, your committee desire to say, that in making their awards, they by no means intend to disparage the various other well known and valuable shuttle machines. The inventors of these *iron sewing fingers* have made almost a pastime of that which taxed severely the health and strength of woman. To them we accord our sincere thanks, and we hope their pecuniary rewards may be commensurate with the benefits conferred.

DR. H. S. CONKLIN.

## THIRD DEPARTMENT.

### MILL FABRICS.

| | |
|---|---|
| Best pound of sewing silk, L. W. Carr, Cleveland | $2 |
| Best 10 yards woolen cloth, W. Fish, Dayton | 5 |
| Best 10 yards cashmere, Jno. Studebaker, Troy | 5 |
| Best 10 yards satinet " " | 5 |
| Best 10 yards jeans, Jas. B. Shaw, Spring Branch | 5 |
| Pair woolen blankets, Jno. Studebaker, Troy | 5 |
| 10 yards flannel, W. Fish, Dayton | 3 |
| Double carpet coverlet, Philip Weer, Ridgeville | 5 |
| Stocking yarn, W. Fish, Dayton | 3 |

### NEEDLE, SHELL AND WAX WORK.

| | |
|---|---|
| Best ornamental needle work, Mrs. W. Smith, Dayton | $3 |
| Best group artificial flowers, Mrs. A. C. Brown, Dayton | 3 |

| | |
|---|---|
| Best variety worsted work, Miss Hayden, Columbus | $3 |
| Best fancy needle chair work, Miss C. Steele, Dayton | 3 |
| Best worked cushion and back, Mrs. H. Pease, Dayton | 3 |
| Best woolen shawl, Mrs Mary A Butler, Delaware | 3 |
| Best worked quilts, Mrs. M. Fry, Dayton | 3 |
| Best white quilts, Mrs. D. Garst " | 3 |
| Best patch work, Mrs. W Griffin " | 3 |
| Best silk quilt, Mrs. A. O. Brown " | 3 |
| Best worked portfolio, Mrs. Dr. W. Smith, Dayton | 3 |
| Best lamp stand and mats, Mrs. Owen " | 3 |
| Best ornamental shell work, Mrs. L. G. Bailey, Sidney | 3 |
| Second best ornamental shell work, Mrs. Ada Sanders, Dayton | 2 |
| Best silk embroidery, Mrs. Wm. Atkin, Dayton | 3 |
| Best embroidered sofa cushion, Mrs. Mary E. Butler, Delaware | 3 |
| Best embroidered dressing gown, Mrs. Dr. W. Smith, Dayton | 3 |
| Best embroidered slippers, Mrs. A. O. Brown, Dayton | 3 |
| Best worked vail, Mrs D. Garst, Dayton | 3 |
| Best worked handkerchief, Miss S. Bronson, Cincinnati | 3 |
| Best woolen shawl, Miss Carrie Brown, Dayton | 3 |

### HOUSEHOLD FABRICS.

| | |
|---|---|
| Best pair woolen blankets, Wm. Richardson, Lebanon | $5 |
| Second best pair woolen blankets, Wm, Stansell, Centreville | 3 |
| Best 10 yards linen, Mrs. E Koefer, Dayton | 4 |
| Second best 10 yards linen, Mary Harbough, Columbus Grove | 3 |
| Best 10 yards kersey, Mrs. Mary E Matchem, Pittsfield | 5 |
| Best 15 yards rag carpet, Mrs. D. H. Morrison, Dayton | 5 |
| Second best 15 yards rag carpet, Mrs Mary Turner, Dayton | 3 |
| Best double carpet coverlet, Mrs. E. Matchem, Pittsfield | 5 |
| Second best double carpet coverlet, Mrs. G W. Kemp, Harshmansville | 3 |
| Best pair woolen knit stockings, Mrs. A. O. Brown, Dayton | 2 |
| Second best pair woolen knit stockings, Mrs. Wm. Ramsey, Centreville | 1 |
| Best pair linen knit stockings, Mrs. R W. Osborn, Sandusky | 2 |
| Second best pair linen knit stockings, Mrs. M. Ramsey, Centreville | 1 |
| Best pair cotton knit stockings, Mrs. E. Matchem, Pittsfield | 2 |
| Second best pair cotton knit stockings, J. E. Geddes, Ripley | 1 |
| Best pound linen sewing thread, Mary Harbough, Columbus Grove | 2 |
| Best pair woolen fringe mittens, Mary Harbough, Columbus Grove | 2 |
| Second best pair woolen fringe mittens, Mrs. M. Ramsey, Centreville | 1 |
| Best pair mittens, Mary Harbough, Columbus Grove | 2 |
| Best pair mittens by a Miss under 12 years, Ella Stage, Columbus | 2 |
| Second best pair mittens, Thos. Bushnell, Ashland county | 1 |
| Best stocking yarn, Mrs. E. Matchem, Pittsfield | |
| Best gentlemen's shirts, Mrs. M. Fry, Dayton | 2 |

### WORKED METALS.

| | |
|---|---|
| Best display of axes, J. S. Benjamin, Dayton | $3 |
| Best horse shoes, Jno. Sisty, Milan | 3 |
| Best brass and copper works, Robt. Ogden, Dayton | 5 |
| Best plumbers' goods and ware " " | 5 |
| Best chandeliers and burners " " | 3 |
| Best iron and steel, Ohio Iron Company, Zanesville | 3 |
| Best mechanics' tools, J S Benjamin, Dayton | 5 |
| Best tin kitchen utensils, W. F. Gephart, Dayton | 3 |

### STOVES, CASTINGS, ETC.

| | |
|---|---|
| Best wood cooking stove, W. F. Gephart, Dayton | $5 |
| Best coal cooking stove " " | 5 |
| Best parlor stove, G. F. Spicer, Cincinnati | 5 |
| Best house furnace, R. A. Kerfoot, Dayton | 5 |
| Best display of hollow ware, Neff, Bennett & Co., Dayton | 3 |
| Best church bell, W. H. Pease & Co., Dayton | 3 |
| Best farm bell, Pritz & Kuhns, Dayton | 3 |
| Best chime of bells, W. H Pease & Co., Dayton | 5 |
| Best display of stoves, Neff, Bennett & Co., Dayton | Commended. |

### CABINET WARE.

| | |
|---|---|
| Best dressing bureau, M. Ohmer, Dayton | $5 |
| Best sofa, O. P. Boyer " | 5 |
| Best extension table, P. Holverstick " | 3 |
| Best set of parlor chairs, M Ohmer, Dayton | 5 |
| Best display of furniture, O. P. Boyer, Dayton | 10 |
| Best centre table " " | 5 |
| Best set of parlor furniture, M. Ohmer, Dayton | 10 |
| Best French bedstead, M. Ohmer, Dayton | Commended. |

### *Report of Committee on Cabinet Ware.*

The committee on cabinet ware have examined all the articles on exhibition, and find them of good quality. There are a number of articles exhibited not specified in the premium list, which the committee would recommend to the favorable consideration of the Board; among which is a folding bed, by W. B. Pease, of Dayton, a spring mattrass, by H. P. Dackey, of Piqua, also a paper file, by J. M. Turner.

Jas. B. Monroe,
Henry Barnes,
J. H. Shawk.

### COOPERS' AND CARPENTERS' WARE.

| | |
|---|---|
| Best display of cedar ware, Thomas Brown & Son, Dayton | $3 |
| “ pine ware, “ “ | 2 |
| “ window blinds, John Rouzer, “ | 3 |
| “ walnut doors, “ “ | 3 |
| Best flour barrels, Adam Clingman, Harshmansville | 3 |
| “ butter firkins, Thomas Brown & Son, Dayton | 2 |
| “ turned ware, “ “ | 3 |

### *Report of Committee on Coopers' and Carpenters' Ware.*

We, the committee, report that the articles exhibited to us were of the best quality, and we recommend them to a generous public. In addition to the premiums awarded, we recommend a diploma to Thomas Brown for display of pine and cedar ware.

C. Smith,
Jos. W. Clayton,
John Kusler.

### SADDLERS' AND SHOEMAKERS' WARE.

| | |
|---|---|
| Best traveling trunk, Crew & Warford, Dayton | $5 |
| “ display of boots and shoes, N. P. Douglas, Dayton | 10 |
| “ set of carriage harness, Crew & Warford, “ | 5 |
| “ set of farm harness, “ “ | 5 |
| “ display of leather, F. Leslie, Newark | 5 |
| “ display of shoe lasts, Crawford & Stillwell, Dayton | 3 |

### *Report of Committee on Saddlers' and Shoemakers' Ware.*

The committee find in this class (No. 9) a very limited display, but the articles exhibited are generally first quality.

J. McDaniel,
Brice Hitton,
Martin Warner.

### CHEMICALS.

| | |
|---|---|
| Best writing fluid, A. Sheets, Dayton | $1 |
| “ display of blacking, J. Sarter, Cleveland | 1 |
| “ lubricating and illuminating coal oils, Smith & Salisbury, Newark | 5 |

### *Report of Committee on Chemicals.*

The undersigned, committee on chemicals, etc., make the following report:

Of writing fluid but one specimen was presented for inspection, and that was manufactured by A. Sheets, of Dayton, Ohio. It flows freely, is of good color, is quite free from sediment on standing, and your committee is of the impression, judging from its chemical composition, that it will be a durable ink. We recommend a diploma.

Two specimens of blacking were presented. For the best specimen, in the estimation of your committee, we recommend that a diploma be granted to J. Sarter, of Cleveland, Ohio.

Your committee examined three specimens of coal oil for burning. The illuminating properties of each specimen were quite similar; indeed, there was, so far as we could determine, no perceptible difference. The only point of distinction that your committee feel warranted in making is that relating to the more gaseous and volatile properties of the one, and the greater specific gravity of the others. This being the basis of our decision, we recommend that $5 be awarded to Smith & Salisbury, of Newark, O., for the best illuminating coal oil on exhibition.

Your committee examined a specimen of gutta-percha roofing manufactured by Gay & King, of Cincinnati, and we feel free to commend it, so far as known to your committee, as the best known composition for roofing; or, if consistent with the plans of your Board, we would recommend that a diploma be awarded in accordance with our report.

Your committee examined an artificial leg presented by Douglas Bly, of Cincinnati. It does not appear to be embraced in the list of articles for which premiums are offered, but we feel free to commend it as a most ingenious piece of mechanism, combining elasticity, freedom of motion, and strength, in a very great degree of perfection. Your committee are of the opinion that in the free lateral motion which it permits of the ankle-joint, it is an improvement over any artificial legs now manufactured in this country.

The specimens of artificial teeth presented by S. F. Compton, of Dayton, are commended by your committee.

Three specimens of drain tile were examined by your committee, and for smoothness and compactness of manufacture we recommend that a diploma be awarded to J S. Gregory, of Maumee City, O. We commend the specimen of Davis & Richardson, of Union, Montgomery county, for quality of material.

Two calendar clocks were examined by your committee. We were highly pleased with the beauty and simplicity of the machinery by which Mr. Holley Skinner, of Cleveland, O, accomplishes the motions in his calendar. Of the machinery by which Mr. E. H. Jenkins, of Dayton, accomplishes his motions, we cannot speak so definitely. He has, however, one additional motion, *i. e.* equation of time; and all accomplished, as far as your committee can judge, by machinery not liable to get out of order. Your committee would recommend a silver medal to both.

Respectfully submitted,

—— Stoddard,
S. G. Armor,
S. Forrer.

## FOURTH DEPARTMENT.

### FLOUR AND GRAIN.

| | |
|---|---|
| Best barrel flour, Wm. Harris, Dayton | Dip. and $5 |
| Second best barrel flour, Hunter & Co., Hamilton | “ 3 |
| Best half bushel white winter wheat, Thos. Bushnell, Hayesville | 5 |
| “ “ red “ J. Shroyer, New Carlisle | 5 |
| “ “ spring wheat, A. W. Livingston, Reynoldsburg | 5 |
| “ “ oats, T. Bushnell, Haysville | 3 |
| “ “ barley, Joel Funk, Urbana | 3 |
| “ “ buckwheat, S R Holt, Worthington | 2 |
| “ bushel timothy seed, A. W. Livingston, Reynoldsburg | 3 |
| “ “ clover seed, Geo. R. Mumma, Dayton | 3 |
| “ half bushel orchard grass, S. R. Holt, Worthington | 3 |
| “ yellow corn, W. Warden, Cleves | 3 |
| “ white corn, Samuel Bean, Lebanon | 3 |
| “ early corn, Wm. Warden, Cleves | 3 |
| “ collection of varieties of corn, Wm. Warden, Cleves | 5 |
| “ 10 pounds dressed flax, Wm Stansel, Centreville | 2 |

Dayton, Sept. 12, 1861.

One barrel flour, made from two-thirds white and one-third red wheat, 4 bush. 40 lbs. in the rough. Ohio grown. Jacob Shuey.

Hamilton, O., Sept. 12, 1861.

One barrel flour, made from one-half red and one-half white wheat, 4 bush. 45 lbs. in the rough. Ohio grown. Esom Edmonds, for Hunter & Co.

### BUTTER, BREAD, ETC.

| | |
|---|---|
| Best 10 pounds butter in rolls, Miss R. P. Bradford, Dayton | $10 |
| Second best 10 pounds butter in rolls, J. P. Mumma, Dayton | 5 |
| Best 25 pounds May or June butter, Mrs. Mary Thomas, Columbus | 10 |
| Second best 25 pounds May or June butter, Mrs. M. Ramsey, Centreville | 5 |
| Best biscuit, Mrs. W. Bumbarger, Dayton | 2 |
| “ soda biscuit, Mrs. M. Ramsey, Centreville | 2 |
| “ 8 loaves domestic bread, Mary E. Harris, Dayton | 3 |
| “ “ corn bread, Mrs. Judge Morse, Dayton | 3 |
| “ “ brown bread, Mrs. M. Ramsey, Centreville | 3 |

### CHEESE.

| | |
|---|---|
| Best and largest lot under 1 year, A. Fenner, Fidelity | $20 |

### *Report of Committee on Cheese.*

Mr. A. Fenner's cheese was the only lot found worthy of a premium by the committee. We recommend a premium, but cannot say it is a first-rate cheese. There was no written statement, but reference is made to the Agricultural Report of 1852.

JAMES THOMAS,
WILLARD WOODBRIDGE,
AMOS MCSHERRY.

FIDELITY, April 3, 1862.

*Mr J. H. Klippart, Cor. Sec. Ohio State Fair, held at Dayton, Sept*, 1861 :

SIR : As the first premium on cheese under one year old was awarded to me, I will endeavor to comply with the rules as laid down.

The cheese presented by me was made on the 27th of May, 1861, being the milk of twelve cows from two milkings, evening and morning No addition of cream.

1. I consider a cross of the native and Durham stock preferable to the full blood.

2. There is nothing that produces sweeter milk than what is termed the blue grass. But I prefer timothy and clover, equal quantities, as it affords much more pasture, and imparts more nutriment to the soil.

3. It does not. My practice on tillable land is to pasture two or three years, then change to some kind of grain ; in this way the soil will retain its nutritive qualities much longer. Stock should never be permitted to run on land in the spring until the ground is well settled.

4. When land is over thirty-five dollars per acre, it could not be used profitably for dairy purposes, were it not for the rotation system of farming.

5. The temperature of a room should be about eighty degrees; when much higher than that, it is more liable to a rancid or strong taste or smell; when much below, it is likely to have a sour taste, especially if the whey is not thoroughly pressed out, and requires more time to cure and be ready for market.

6. My manner of making, preserving, &c., will be found in the Agricultural Report of 1851.

I submit the above, and ask that my premium be paid in money.

Yours, respectfully, AUGUSTUS FENNER.

### *Statement of Mrs. Mary D. Schutt, Jefferson, Ashtabula Co , Ohio.*

One sage cheese, made one year ago last August. Three cows kept, but not all the milk used. In making the cheese, part of four milkings was used; no addition was made of cream.

Three cheese (two of them sage cheese) made in July, 1861. But two cows were kept; four milkings were used; no addition of cream was made.

They were pressed with a screw, but not very hard during the first half hour; then turned the cheese and pressed harder for twenty-four hours. After taking them from the press, put them in room with north windows open, blinds closed;

grease and turn them every day. In winter, cover them sufficiently to prevent freezing, and let them stand in room without fire, until spring.

Preserve the rennet with salt, and dry them. To prepare them for use, put them in a brine strong enough to keep them sweet.

1st. Consider Durham cows best for dairy purposes.

2d. Cannot tell what variety of grasses produce best pasturage for cheese making.

3d. Cannot, from experience, tell whether long continued grazing exhausts or improves our land.

4th. Cannot state at what price per acre land can profitably be used for dairy purposes.

5th. Cannot give the exact degree of temperature proper for curing cheese, but keep them, during the year, in a room without fire.

6th. Heat the milk about as warm as when drawn from the cow; put in rennet enough to make it into curd in from half to three-quarters of an hour. In warming the curd, make it a little warmer than new milk; let it stand half or three-quarters of an hour; salt it to the taste, and have it quite cold when putting it in the press. Preserve rennet with salt, putting it in brine for use.

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### HONEY, SUGAR AND PRESERVES.

| | |
|---|---|
| Best 10 lbs. honey, Thos. Bushnell, Hayesville | $5 |
| 2d do do R. Wilkin, Londonderry | 3 |
| Best 10 lbs. sorgho sugar, L. Woodhull, Dayton | 10 |
| Best 10 lbs. maple sugar, P. H. Peterson, Xenia | 5 |
| Best gallon maple syrup, Jonah Davis, Bellebrook | 3 |
| Best gallon sorgho syrup, C. Jacobs, Columbus | 10 |
| 2d do do L. Woodhull, Dayton | 5 |
| Best collection of preserves, Mrs. R. R. Dickey, Dayton | 5 |
| 2d do do Mrs. R. M. Dolby, Springfield | 2 |
| 2d do do Mrs. M. Ramsey, Centreville | 1 |
| Best pickled cucumbers, Mrs. R. R. Dickey, Dayton | 3 |
| Best do peaches, do do | 3 |
| Best do tomatoes, do do | 3 |
| Best do walnuts, do do | 3 |
| Best do butternuts, do do | 3 |
| Best do melons and mangos, do do | 3 |
| Best do onions, do do | 3 |
| Best sweet pickled preserves, Mrs. Horace Pease, Dayton | 3 |
| Best preserved blackberries, Mrs. R. R. Dickey, do | 3 |
| Best do tomatoes, do do | 3 |
| Best do raspberries, do S. G. Brown, do | 3 |
| Best do peaches, do R. R. Dickey, do | 3 |

| | |
|---|---|
| Best preserved pears, Mrs. M. Ramsey, Centreville | $3 |
| Best do apples, do R. M. Dolby, Springfield | 3 |
| Best do peaches in cans or jars, Mrs. Wm. Ewing, Groveport | 3 |
| Best pears in cans or jars, Mrs. R. R. Dickey, Dayton | 3 |
| Best cherries do do Horace Pease, do | 3 |
| Best gooseberries do do W. R. Sprague, Reynoldsburg | 3 |
| Best currants do do do do | 3 |
| Best quinces do do W. Ewing, Groveport | 2 |
| Best apple butter, J. H. W. Mumma, Dayton | 3 |
| Best tomato butter, Mrs. M. Ramsey, Centreville | 2 |
| Best peach butter, do do | 2 |
| Best melon butter, do do | 2 |
| Best currant jelly, Miss C. Steele, Dayton | 2 |
| Best apple jelly, Mrs. R. R. Dickey, do | 2 |
| Best peach jelly, do do | 2 |
| Best quince jelly, do do | 2 |
| Best pickled gherkins, do do | 2 |
| Best tomato catsup, Mrs. Julia O'Connor, Dayton | 2 |

### *Report of committee on Honey, Sugar and Preserves.*

Your committee have had no little difficulty in deciding upon the best collection of preserves, but after taking *everything* into consideration—the manner of putting up, the quantity and quality, as well as variety—we have awarded as above. We would commend those who do not receive a premium, as worthy of consideration and emulation. We also remark that we consider it important in putting up fruit, that durability as to cans should always be taken into consideration, as well as easy access to the fruit.

C. H. Winters,
Mary Thomas,
F. L. Nichols.

### *Statement of Robert Wilkin, of Londonderry.*

This honey was made on the Leaf Bee Hive, and lifted from it, comb at a time, without killing a bee. Bees were wintered with sixty others in a dry cellar; received no attention during summer except a general supervision to guard against moths, and taking the combs out once or twice, to see if they had a queen, and all right within the hive.

ROBERT WILKIN.

### *Statement of Samuel Biggar.*

I use the square box hive, with a petition in it, six inches from the top, to put the boxes on to receive the surplus honey, which I consider preferable to any other. There is nothing new in my treatment of my bees. I think all they need is to keep the insects out of them and let them alone.

SAMUEL BIGGAR.

### *Statement of Mrs. Mary D. Schutt.*

I use the common hive, with boxes. Hive is placed in dark room, and after being filled, bees work outside in the room. Have taken from 75 to 100 pounds clean white honey from hive and room yearly, without injuring the bees. Occasionally give bees a little salt.

MRS. MARY D. SCHUTT.

### *Mode of making and clarifying Sugar. By Wm. Stansell, Centreville, O.*

Manufactured in the month of February; use crocks and buckets; careful to keep all leaves and dirt out; boil in sheet-iron pans, to a thin syrup; then let it settle till cool; draw off; then boil until thick enough to run together when dropped into clear pure water; then take from the fire and let stand until it grains; then prepare a coarse sack, sewed into the shape of a cone; then put about 50 pounds into the sack, and drain perfectly dry; then you have an article same as sample. Why I prepare a sack in preference to a cask, is because it drains off quicker, and the molasses does not color the sugar.

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## VEGETABLES, ROOTS, ETC.

| | |
|---|---|
| Best display of potatoes, J. H. Mumma, Dayton | $5 |
| Best ½ bushel do Mrs. M. Ramsey, Centreville | 3 |
| 2d do do Geo. Sager, Miami City | 3 |
| Best display of sweet potatoes, J. T. Needham, Dayton | 4 |
| Best 12 carrots, P. Hellrigle, Dayton | 3 |
| Best 12 long blood beets, S. R. Holt, Worthington | 3 |
| Best 12 turnip beets, J. H. Mumma, Dayton | 3 |
| Best peck tomatoes, John Wolf, do | 3 |
| Best display of tomatoes, P. Hellrigle, do | 4 |
| Best 3 heads drumhead cabbage, P. Hellrigle, Dayton | 3 |
| Best display of onions, do do | 4 |
| Best 12 roots salsify, A. W. Livingston, Reynoldsburg | 3 |
| Best display of peppers, John Wolf, Dayton | 3 |
| Best ½ peck Lima beans, Mrs. M. Ramsey, Centreville | 3 |
| Best do white beans, John Shroyer, New Carlisle | 3 |
| Best peck pole beans, A. W. Livingston, Reynoldsburg | 3 |
| Best peck bunch beans, do do | 3 |
| Best peck field peas, do do | 3 |
| Best display garden peas, do do | 4 |

### *Report of committee on Vegetables, Roots, etc.*

Your committee regret to say that in quantity this class is the poorest exhibition ever seen at a State Fair, and in quality would not average over second rate.

We commend entry No. 44, Philip Hellrigle, for display of twenty-eight varieties of vegetables.

Henry Ridenour,
J. B. Gates,
W. H. Morningstar,
Ed. Jaeger.

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## FIFTH DEPARTMENT.

### FLOWERS.

#### PROFESSIONAL LIST.

| | |
|---|---|
| Best 20 varieties in bloom, Wm. Heaver, Cincinnati | $15 |
| Second best 20 varieties in bloom, Mrs. M. A. Jemison, Dayton | 10 |
| Best 12 varieties in bloom, Wm. Heaver, Cincinnati | 6 |
| Second best 12 varieties in bloom, J G. Breene, Greencastle | 4 |
| Best 6 varieties in bloom, Mrs. M. A. Jemison, Dayton | 3 |
| Best collection of plants of variegated foliage, Wm. Heaver, Cincinnati | 5 |
| Second best collection of plants of variegated foliage, Sayers and Hutcheson, Cincinnati | 3 |
| Best display cactus and aloes, J. G. Breene, Greencastle | 5 |
| Second best display cactus and aloes, Mrs. M A. Jemison, Dayton | 3 |
| Best display verbenas, Sayers & Hutcheson, Cincinnati | 4 |
| Second best display verbenas, Mrs. M. A. Jemison, Dayton | 3 |
| Best display fuchsias, Sayers & Hutcheson, Cincinnati | 3 |
| Best display petunias, Mrs. M. A. Jemison, Dayton | 3 |
| Best display phloxes, Wm. Heaver, Cincinnati | 3 |
| Second best display phloxes, J. G. Breene, Greencastle | 2 |
| Best display geraniums “ “ | 3 |
| Second best display geraniums, Jabez Johnson, Dayton | 2 |
| Best display asters, J. G. Breene, Greencastle | 3 |
| Second best display asters, Jabez Johnson, Dayton | 2 |
| Best display gladiolus, Wm. Heaver, Cincinnati | 3 |
| Best display dahlias, Sayers & Hutcheson, Cincinnati | 3 |
| Second best display dahlias, Wm. Heaver “ | 2 |
| Best 12 varieties “ “ “ | 3 |
| Second best 12 varieties dahlias, Sayers & Hutcheson, Cincinnati | 2 |
| Best and greatest variety of verbenas “ “ | 3 |
| Best and greatest variety of cut roses, Wm. Heaver, Cincinnati | 5 |
| Best and greatest variety cut flowers “ “ | 5 |
| Best pair hand pyramid boquets “ “ | 2 |
| Best pair convex or French boquets “ “ | 2 |
| Best 15 inch boquet and vases “ “ | 2 |

### *Report of Committee on Flowers—Professional List.*

The committee would recommend that a premium be awarded to Sayers & Hutcheson for their remarkably fine specimen of Norfolk Island pine—*Auracaria excelsa*—as it was the most prominent and interesting plant in the Hall; and also another to Mrs. Perrine, of Dayton, for her fine specimen of Grape Myrtle, *Ligersteraema Indica.*

J. Kirkpatrick,
Josehh Perkins,
L. S. Jackson.

### AMATEUR LIST.

| | |
|---|---|
| Best 20 varieties in bloom, Mrs. E. Langstedt, Dayton | $15 |
| Best 12 " " " | 6 |
| Best 6 " Mrs. E. H. Pierce " | 3 |
| Second best 6 " Mrs. E. Langsted " | 2 |
| Best collection plants of variegated foliage, E Langstedt, Dayton | 5 |
| Second best collection plants of variegated foliage, D. W. H. Pease, Dayton | 3 |
| Best display cactus and aloes, Mrs. E. Davis, Dayton | 5 |
| Best display fuchsias, D. W. H. Pease " | 3 |
| Best display cut dahlias, Mrs. E. Langstedt " | 5 |
| Second best display cut dahlias, Mrs. McIlheny, Dayton | 3 |
| Best 12 cut dahlias, Mrs. R. W. Steele " | 3 |
| Second best 12 cut dahlias, Mrs. E. Langstedt " | 2 |
| Best display of cut verbenas, E. H. Pierce " | 3 |
| Second best display of cut verbenas, L. H. Beall, Xenia | 3 |
| Best pair hand pyramid boquets, Mrs. E. H. Pierce, Dayton | 2 |
| Best pair boquets, 15 inches high, Mrs. E Davis, " | 3 |
| Best floral ornament " " | 5 |
| Second best floral ornament, E. Langstedt, " | 3 |
| Best basket of flowers, E. Davis " | 5 |
| Second best basket of flowers, W. Smith " | 3 |

### *Report of Committee on Flowers—Amateur List.*

The committee consider the beautiful pyramid of cut flowers and boquets from the pupils of the Central High School of Dayton, very fine, and one of the handsomest and best arranged ornaments in Floral Hall, and had they been entered, would have taken the first premium. Too much praise cannot be given to the ladies of the Central High School for their skill and taste in collecting and arranging this beautiful ornament.

Your committee cannot allow this opportunity to pass without expressing their approbation of the fine display of plants, ornaments, designs, &c., the whole making the largest and best display ever seen at a State Fair.

S. S. Jackson,
Mrs. J. Dana,
F. Rentland.

## FRUITS.

### APPLES.

| | |
|---|---|
| Best 10 varieties of 5 each, H. H. G. Smith, Toledo | $5 |
| " 6 " " " " | 3 |
| " 6 winter apples, " " | 3 |
| " ½ bush. of 10 varieties, " " | 3 |
| " display in variety and quality, " | 10 |

### PEACHES.

| | |
|---|---|
| Best 6 varieties of 6 each, Wilson, Mills & Co., Ridgeville | $5 |
| 2d " John Porter, Mulberry | 3 |
| Best variety of 6 each, J. H. Stansel, Centerville | 2 |
| 2d " " C. Thompson, Dayton | 1 |
| Best and greatest display, W Richardson, Lebanon | 8 |
| 2d " " Wilson, Mills & Co., Ridgeville | 5 |

### PEARS.

| | |
|---|---|
| Best 10 varieties, George Powers, Perrysburg | $5 |
| 2d " J. B. Pullen & Son, Lebanon | 3 |
| Best 5 " George Powers, Perrysburg | 3 |
| 2d " Wm. Heaver, Cincinnati | 2 |
| Best 3 " George Powers, Perrysburg | 3 |
| " display of pears, Wm. Heaver, Cincinnati | 10 |
| 2d " " George Powers, Perrysburg | 5 |

### QUINCES.

| | |
|---|---|
| Best 12 quinces, Wm. Richardson, Lebanon | $3 |
| 2d " Mrs. R. R. Dickey, Dayton | 2 |

### PLUMS.

| | |
|---|---|
| Best plate of 12 plums, J. M. Glover, West Liberty | $2 |
| 2d " " Miss Fekinger, Dayton | 1 |

### MELONS.

| | |
|---|---|
| Best 6 watermelons, John Vance, Dayton | $2 |
| " 6 muskmelons, Jacob Puterbaugh, Miami City | 2 |

### RASPBERRIES.

| | |
|---|---|
| Best quart raspberries, A. M. Gatch, Milford | $3 |
| 2d " " John Wolf, Dayton | 2 |
| Best collection of uncultivated fruits, Thos. Bushnell, Hayesville | 5 |
| 2d " " nuts, " " | 6 |

### GRAPES.

| | |
|---|---|
| Best new seedling, Jason Brown, Akron | $4 |
| 2d " G. W. Campbell, Delaware | 3 |
| Best plate foreign grapes, H. H. G. Smith, Toledo | 2 |
| " display of 6 varieties, G. W. Campbell, Delaware | 6 |
| " 3 varieties under glass, " " | 4 |
| " bunch, " " | 1 |

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### *Report of Special Committee appointed to examine articles exhibited by Mr. Benjamin M. Nyce, of Decatur county, Indiana.*

APPLES.—Pennock, Romanite, Newtown Pippin, Rhode Island Greening, White Bellflower.

Neshannock potatoes.

The above articles were all the growth of 1860, and had been kept in a fine state of preservation in a preserving house in Indianapolis, the preservative principle of which is the invention of Mr. Nyce, for which he has a patent.

Your committee, on a careful testing of the articles presented, have the pleasure of stating that the apples retained, nearly to the full extent, their characteristics when in their best condition. The Pennock your committee consider considerably improved in its saccharine quality. The potatoes were in as fresh, plump and sound condition as if only taken from the ground yesterday. Your committee consider the invention of Mr. Nyce one likely to prove of great public benefit, and have great pleasure in commending it to the favorable consideration of the Board.

Your committee are promised by the inventor and patentee a detailed statement of the philosophical principles and mechanical construction of the building, by which he is enabled to preserve perishable articles, especially fruits and vegetables, months, if not years, beyond their natural period for decay, and hope at a future time to be able to make a fuller and clearer exposition to your Honorable Board on what appears to us a most valuable invention.

R. W. STEELE,
H. B. LUM,
WM. HEAVER.

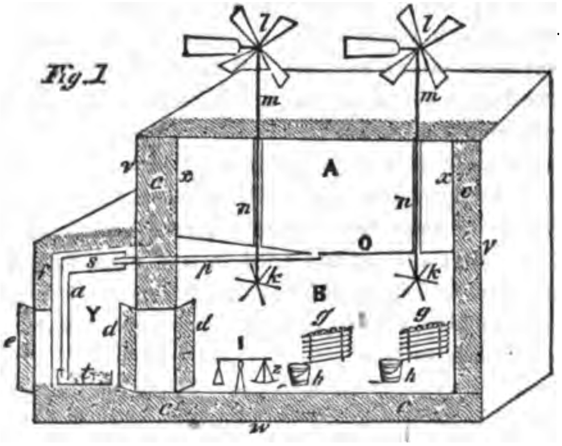
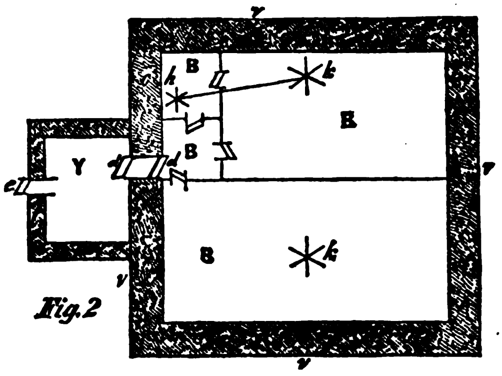


Fig. 1 is a vertical section, and Fig. 2 a horizontal section of B. M. Nyce's preserving house.



*A* is a reservoir, made of strong galvanized or zinced iron (*O*) at the bottom, and of zinc at the sides (*X*), to contain, when filled, 6 feet depth of ice.

*B*, the fruit room, divided, as seen in Fig. 2, into four apartments.

*C*, walls 3½ feet thick, containing well packed cut straw or chaff, or dried saw dust.

*d*, two doors, one on the inside and one on the outside, 6 inches thick, filled with chaff, fitting closely to the door frame by means of cotton batting tacked or nailed round the edges.

*e*, a door opening into the ante-chamber *Y*.

*Y*, an ante-chamber, which is entered through the door *e*, previous to going into the fruit room through the doors *d*.

*f*, walls 15 inches thick, packed with chaff round the ante-chamber *Y*.

*g*, *g*, tiers of movable troughs, 4 or 6 inches apart, on which is kept constantly a supply of dry chloride of calcium. This chloride is similar in its composition to common salt; like it, it omits no smell, is equally indestructible by heat or cold, and cattle and hogs love it as much as salt. It must not be confounded with chloride of lime; it is a totally different substance. Its peculiar property is its wonderful power of absorbing moisture. When perfectly dry, if spread out in a plate on a warm day, it will in an hour or less take up from the atmosphere two or three times its weight of water.

Put muriatic acid (cost 5 cents per pound) in a bucket; throw in pieces of marble; when the bubbling ceases, the chloride in its fluid state is made.

*h*, wooden buckets to catch the chloride as it runs down from the troughs. The buckets, when full, are taken out and dried in iron pans, with a small furnace; the chloride is then broken in small pieces, and put back into the troughs. It may be renewed endlessly, without change. One dollar's worth will be sufficient for one hundred bushels of fruit.

*I*, scales to indicate changes of moisture. In the ditch *s*, we put in, say one-half ounce of perfectly dry clean chloride of calcium; we then pour on one ounce of rain water. The degree of fluidity thus attained we keep as our standard or zero point. Should moisture in the room *B* increase, the chloride in the dish will take up more, and the dish will fall; should dryness in the room increase, it will give off vapor, and the dish will rise. In practice we find this hygrometer more needful than the thermometer; we consult it daily, and rely entirely upon its indications.

*k*, fans in each room, moved by the wind-wheel, *l*, to circulate the air in the rooms *B*.

*m*, rods running down through the ice in the tubes *n*. The tubes are soldered to the galvanized iron ice floor, *O*, and the space between the rods (*m*) and the tubes (*n*) is packed with cotton.

*O* is the ice floor, made of strong galvanized sheet iron, the seams strongly riveted and soldered, so that it is a perfectly water-tight metallic basin.

*p* is a discharge pipe conveying the waste-water from the ice into a tank, *s*, which is made water-tight on all sides. It cools the ante-chamber (*YX*) down to about 60°.

*t* is a milk trough kept full of cool water from the tank *s*, through the tube *n*.

*v* is the outside casing of the walls *C*, made of sheet iron, the edges thickly pointed, lapped or nailed, so as to be air-tight.

*w*, sheet zinc, the edges soldered. It is put directly on the ground, to prevent moisture and air from entering the chaff, *C*.

Coldness, dryness, purity, equality of temperature, absence of light, are the necessary elements of a good preserving atmosphere. Our improvement secures them all in great perfection.

1st. *Coldness.*—The room *B* is surrounded at the bottom and sides with insulating walls and doors, as nearly perfect as possible. The ice floor, *m*, is always ice cold, having ice constantly on its entire upper surface. Any warm air in the room at once ascends to this floor, and is soon chilled nearly to the temperature of ice itself. Our rooms *B* maintain an even temperature of 36° during the entire summer. Weeks of excessive heat increase somewhat the melting of ice, but produce no perceptible change on the thermometer. The heat of individuals and warm substances put in, raises the temperature for the time, but variations of heat and cold without produce no change whatever in the rooms *B*.

2d. *Dryness.*—We keep constantly in the troughs, *g*, a supply of dry chloride of calcium. There are not, perhaps, four days in the year in which the fans, *k*, do not move more or less. The moisture generated in the rooms *B* by evaporation from fruit, from the candle, and the bodies and lungs of operators in the rooms, is soon, by the playing of the fans, brought in contact with this chloride, and is speedily absorbed by it.

Our labor is greatest when fruit is laid in in the fall. One hundred bushels of apples will then throw off, in undergoing what is called the sweating process, one pint of water per day. The largest quantity of dry chloride must then be constantly spread out upon the troughs. If the room be full of fruit, it should be dried and renewed once or twice per day. In a few weeks, after the fruit is brought down to 34°, not one-fifth of the labor will be needed. The practical chemist, familiar with this wonderful absorbent, perceives at once that on this plan an atmosphere may be kept dry to any extent. It may be made so dry as to wilt and dry up the fruit in it. The hygrometer, *I*, enables us to regulate this. If it indicates dryness in excess, we slacken the supply of chloride, and if windy, ungear the fans; if moisture increases, we renew the chloride, and suffer the fans to play.

From September until May, when the weather is sufficiently dry (which a hygrometer kept outside also indicates), and the thermometer ranges between 25° and 35°, we are in the habit, both night and day, of opening the doors which we have made for this purpose, on opposite sides of the rooms. The dry air from without, by the aid of the fans, circulates through the fruit, and, without materially changing the temperature, does away with the use of the chloride almost entirely, especially during the winter months.

3d. *Purity*—From the last dry frosty night in May till the first one in September or October, the air of our room, except what gets in and out on opening the doors, is entirely separate from the air without. Can the air be kept pure? We answer, pure air does not change. Oxygen and nitrogen, its prominent elements, are simple and unchangeable. Nor is it supposed that the small amount of carbonic acid and vapor in it change. By a bad air we do not mean that its elements, either singly or in combination, have changed, but that some foreign noxious substances have entered into it. Our room may be called a great mammoth metal can; the miasma from stagnant pools, marshes and lakes, and the effluvia that arise from millions of bodies, animal and vegetable, living and dead, do not enter into it. Circulation, also, in water and air, in a way perhaps not well understood, produces purity. We have also the full benefit of this, for whenever there is circulation in the world without, our wind-wheel produces it in our miniature world within. We have yet no proof that the simple odor of an apple, lemon, or any other fruit, is injurious to the fruit itself. The chloride, however, in taking up vapor, takes up to a considerable extent odoriferous gases with it; and fresh dry charcoal, which we sometimes use, does this in a very remarkable manner. We divide our preserving chamber into separate apartments (in the drawing [Fig. 2] there are four, which we think sufficient for ordinary uses), by partitions of sheet iron, so that each one will have only those substances whose vapors or gases are harmonious to each other. Beets, parsnips, carrots, cabbages, turnips, may be together without material injury. We put them in one room, apples and pears in another, lemons and oranges in another, butter and eggs in another. Decomposition in a dry atmosphere of 34°, proceeds very slowly; and most of the fruits at that temperature emit scarcely any smell at all. We refer to the reports of the Cincinnati Horticultural Society—especially the one dated December 15, 1860—for proof that there is no practical difficulty on this point.

## OUR SUCCESS THUS FAR

1st. *Apples.*—Of 110 bushels of good keeping apples, put in our house at a cost of 40 cents per bushel, in September and October, 1860, 100 bushels were sold at Indianapolis, in May, June and July, 1861, at prices varying from $2 to $3—mostly $2 25 per bushel. Our preserving chamber was far less perfect then than it is now, and we think that in regard to all good keeping apples put in at the proper time, 14 bushels out of 15 put in may be kept in good condition for the market during the above named months, giving generally an average profit of $1 per bushel on all such apples laid in in the October previous.

*Pears.*—The fact that most pears should be pulled while green, is much in our favor. August pears put in green, may in general be kept good till Christmas, and later ones during the winter months.

*Peaches.*—We cannot keep a ripe peach good more than two or three weeks. We don't know the reason why

*Squashes, Pumpkins, Melons, Sweet Potatoes.*—We do not succeed with any of them; our room is too cold.

*Strawberries, Raspberries, Blackberries.*—We keep them in good marketable condition one month. Some remain apparently sound six, seven, and eight weeks, but the flavor leaves them. There is not much profit in keeping them, except to the large producer. He can hold them over when the market is glutted, till the demand increases. To him our house is of much value.

*Lemons and Oranges.*—If equally sound, they keep about equally well. One hundred boxes of sound lemons, bought in March or April last, kept well till the latter part of July, and were sold in the market till the middle of September, but the increasing decay towards the last took away the profits of keeping them. They—especially the lemons—are very perishable when taken out of the house in hot weather, so that it is not then profitable to ship them to a distance. The flavor of the lemon and orange, even in September, is always perfectly maintained. If we could rely on the honesty of Eastern dealers in sending sound ones, the purchase of them, to the extent of the demand of the city where the house is located, may be made valuable.

*Vegetables*—In general they keep well till the new crop comes in, but they must be kept by themselves; the smell from them—especially the turnip, if kept in any quantity—is quite injurious to fruit.

*Irish Potatoes.*—This vegetable is exceedingly popular during the month of June; is preferred to the new potato until fully ripe. We have for several years sold potatoes in June for two, three, and even four times its worth in the month of April previous.

*Butter*—In a separate room, insulated completely from the flavor of foreign substances, it can be kept fresh to any period desired.

*Eggs.*—We have good eggs, kept since March. Fresh spring eggs we can generally keep in good condition till fall and winter. But we would not advise entering upon the egg business in a large way, where eggs promiscuously of all kinds are gathered in, without further trial.

*Tomatoes.*—The small hardier kinds may be depended on for about two months.

*Grapes*—We have not yet kept them to any extent, but see not why the report below given may not be made true with grapes, properly laid in, on a scale however large.

*Canned Fruit.*—We have put up a quantity of tomatoes, peaches and blackberries, in large cans or jugs, which we can afford to retail to good profit in the market or store, at the following rates: Tomatoes of the best quality for 8 cents per quart; the best seedling peaches for 9 cents per quart, and the largest choice improved peaches for 15 cents per quart; blackberries for 12 cents per quart. We can sell at these low rates for the following reasons: 1st. The large cans cost us 4 or 5 cents to the quart less than the small ones. 2d. Kept constantly at a dry temperature of 34°, there is little corrosion of the internal coatings, the fruit is kept purer and better, and the same can may be used for a number of successive years. 3d. We can keep these fruits in our house in the open dish or bucket, three or four weeks, and hence there is no danger of loss in opening large cans. 4th. There is little or no danger of losing cans imperfectly sealed, by fermentation. 5th Putting up fruit in a large way on the spot where it is grown, enables us to do it at greatly reduced prices.

It gives us great satisfaction to believe that we can in this way serve acceptably the laboring classes in cities and large towns, by bringing these valuable luxuries within the reach of all.

It is a cardinal point with us, that we put all fruits in our house as soon as they will bear plucking from the tree or the vine, for the reason that it is much easier to keep green than ripe fruit from rotting.

*Cost of the house.*—In general, it may be stated that a permanent building will cost as many dollars as it will hold bushels of fruit on its shelves. One holding 300 bushels would cost with us $500; one holding 5,000 bushels only $4,000.

Mr. Benjamin M. Nyce, of Mackoy's Station, Indiana, being called upon, remarked that the main feature of his plan for preserving fruit consisted in producing a mechanical current of air. For absorbing the moisture, he used chloride of calcium; this chemical has a wonderful power to absorb moisture.

The absorbents are not effectual in taking up the moisture in the contained air of the room, without circulation, which, in Mr. Nyce's plan, is produced by means of a fan driven by a wind-wheel. He says his room might be called a "great mammoth metal can." The atmosphere must be cold, 32 degrees, and quite dry. Purity was the second point, which he obtained by placing lumps of charcoal in the room. The power of charcoal to absorb impurity was as great as that of chloride of calcium to absorb moisture. Place harmonious fruits, such as apples and pears, together, and you have no conflict. The same air was maintained in this room summer and winter. In the winter, on cold dry nights, when the thermometer is down to 35 degrees, he sometimes opens the doors. You can crowd the room in the winter with apples, grapes and pears, which may be brought out in the hungry months of April, May and June. Its use in the summer will be to fill it with oranges, lemons and eggs.

When asked how long he had kept eggs, Mr. N. replied he had eggs put up in July, which were so good now that it would be impossible to tell but that they were laid yesterday. Milk had been kept fifty-five days.

To show the rapid decline in the ratio, Mr. Nyce said that at 38 degrees he had kept milk ten days, at 36 degrees twenty days, and at 34 degrees fifty-five days, in the summer time.

In Indianapolis there is a preserving room in dimensions 40 by 50 feet, by 10 feet high; this will contain 12,000 bushels of fruit packed full, or 6,000 bushels on shelves, in drawers or boxes. Cost about $8,000.

The preserving house is thus constructed: A firm foundation is built, ground smoothened and overspread a quarter of an inch in thickness with tar and pitch; over this a floor of sheet iron; then chaff; afterward sheet iron again; the walls, thus, are 3½ feet thick; outside wall sheet iron; inside sheet iron, in the preserving room. In the ice room galvanized iron is used, to prevent corrosion.

Mr. Nyce's house at Mackoy's Station is 20 by 20 feet, by 8 feet high; holds on shelves 1,000 bushels apples; cost to build it, $800. Apples put in at a temperature of 75 degrees, are brought down to 35 degrees in three or four days.

In this cold room—ice on top, so that the air is kept as cold as ice all the time—sweet potatoes, pumpkins, squashes and peaches will not keep; they must be kept warm and dry, at a temperature of about 50 degrees. Peaches fail to keep; they evaporate, leaving a dry, hard substance, as hard as a stone. So with all fruits having longitudinal fibres.

He thinks he will be able to overcome the difficulty; cannot tell yet; keeps butter in his room to test the atmosphere; this was almost as rapid an absorbent as charcoal: indeed there was a contest between the butter and the charcoal, as to which should take up the impurities the soonest.

Dr. Petticolas said he had on on one occasion kept grapes in cork sawdust until the May exhibition, perfectly sound; but they were affected by the odor, so that they were unfit to eat. This was in an open box. At another time he kept some in a tight box, and they all rotted.

The ordinary methods of keeping apples were referred to—during which Major Millikin said that in his experience, boxes or drawers were much better for keeping apples in than boxes; they were more economical, easier handled, and when began on a box sooner used up; for, after being opened, they are apt to decay soon.

CINCINNATI HORTICULTURAL ROOMS, MARCH 2, 1861.

From B. M Nyce, of Decatur county, Indiana—kept in his Fruit Preservator—Apples, picked August 12th, B. Bosc, Clion, Flemish Beauty, Belle Lucrative, in fine condition.

Also, Grapes, Catawba, from Kelley's Island, Ohio, as good as fresh.

JNO. A. WARDER, Chairman.

*Report on fruits preserved by B. M. Nyce, Mackoy's Station, Decatur county, Ind., in his patented preserving house, some of which were picked August* 12, 1860.

Beurre Bosc, the original flavor and qualities very well preserved.

Belle Lucrative, remarkably well preserved.

Clion, or Vicar of Wakefield, as good as it can be in its unripened condition, but showing that the principle of preservation is a perfect one. These specimens were picked before fully ripe.

Urbaniste—delicacies, a very fine pear, admirably preserved.

Autumn Colmar, well preserved.

Jaminette, a winter pear; sweet, and as good as usual.

Grapes, Catawba, from Kelley's Island; reported to be as good as when first picked.

Your committee take great pleasure in noticing these fruits, which are the result of the application of science to the every-day operations of the farm and garden. The horticulturist may grow the finest fruits in their season, and enjoy them with his friends in their day; but it requires the patient efforts of the man who will studiously apply the aids of science to the wants of his fellow man, to preserve these choice results for an almost indefinite period. Here we have some delicious fruits preserved for nearly seven months, and presented to us in their perfect condition.

Approved.

WM. STOMS,
R. M. REILLY,
WM RESOR,
THOS. SHERLOCK,
JNO. A. WARDER.

JULY 20, 1861.

From Benj M. Nyce, of Mackoy's Station, Decatur county, Indiana:

*Apples*—Growth of 1860, preserved in his Patent Preserving Fruit Room: Pennock, Romanite or Gilpin, White Winter Pearmain, White Bellflower, Rhode Island Greening, Pryor's Red, Northern Spy, Raul's Janet, Rambo, Campfield.

*Strawberries*—Gathered seven weeks since—sound and fresh.

*Raspberries*—Blackcap—sound.

*Cherries*—sound.

*Potatoes*—Growth of 1860, perfectly souhd, showing no disposition to sprout, or grow, or wilt.

These products furnish further evidence, if any such were needed by this Society, that the ingenious application of scientific truths has enabled our enterprising friend Nyce to arrest the natural process of decay in our perishable fruits, most of which appear before us in a perfectly sound condition after months of isolation from the parent trees upon which they acquired their growth and perfect maturation.

JNO. A. WARDER, Chairman.

*Report to Cincinnati Horticultural Society, upon the Pears forwarded to the Society by Mr. B M Nyce, of Indiana, from his Ice Conservatory, and placed in the hands of your humble servant to return when ripe, to report.*

DEC. 15, 1861.

Said pears, upon being subjected to a heat nearly uniform of 70 degrees, were found to ripen too rapidly to warrant me any hopes of bringing the same in for the action of our regular Fruit committee. Hence, an impromptu committee, composed of the following gentlemen, was invited to assist in testing the qualities of the fruit:

Mr. H. J. Estcourt, of Ireland; Mr. J. C. Aldrich, of New York; and M. J. F. Cole, of Cincinnati.

Comments, as follows, will show the estimate of the same, as made by them:

No. 1. Rousellette Stuttgardt—Juicy, and of a rich saccharine flavor, reminding one somewhat of the Belle Seckle.

No 2. Bartlett—Kept a little too long; still somewhat juicy; a little more saccharine than usual, and quite good.

No 3. Belle Lucrative (?) or something else, enjoying all that excellence for fine flavor, and melting-buttery lusciousness that so deservedly belongs to the Belle's reputation—fully up to the Belle's summer reputation.

No. 4. Unknown—in good condition—rather of an insipid sweetness, apparently its natural character; sound, and free from blemish.

Rousellette Stuttgardt—Rich flavor, saccharine, and perfectly natural tone of excellence.

Bartlett—Good enough to remind you of its finer qualities—kept a little too long.

Belle Lucrative—Is in full and complete condition—rich, juicy and delicious—fully up to its summer reputation—very juicy and buttery.

One—not recognized—in good condition—insipid sweetness, naturally so, apparently, but free from blemish.

Also, the well known Burre Bosc; enjoying in every particular all of its well known characteristics of excellence.

We feel warranted in saying that all of the foregoing fruit attained their natural color at maturity, and seems to be entirely divested of any foreign odor or flavor, so common to fruit kept by any process out of their ordinary seasons.

Robert Reilly, Chairman.

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### SIXTH DEPARTMENT.

#### PAINTINGS, DRAWINGS, ETC.

| | |
|---|---|
| Best life-size photograph, colored, Lewis Seebohn, Dayton | $10 and med. |
| Second best life-size photograph, colored, J. W. Cridland, Dayton | $5 and dipl. |
| Best uncolored photograph, Lewis Seebohn, Dayton | Silver medal. |
| Second best uncolored photograph, S. Gessman, Dayton | Diploma. |
| Best specimen fruit painting, E Edmondson, Dayton | Silver medal. |
| Best specimen flower painting, Miss Mary Forrer, Dayton | “ |
| Best engraving on stone, Ehrgott, Forbinger & Co., Cincinnati | “ |
| Best specimen penmanship, Bryant, Folsom, Stratton & Felton, Cleveland | Dipl. |
| Best collection of marble work, E. La Dow, Dayton | Silver medal. |
| Best architectural drawings, M. Burrows, Dayton | Diploma. |
| Best specimen marble sculpture, E. La Dow, Dayton | Silver medal. |
| Best collection and greatest variety of Ohio birds, Thos. B. Whiley, Columbus | “ |

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#### MUSICAL INSTRUMENTS.

| | |
|---|---|
| Best grand or semi-grand piano, Soehner & Rex, Dayton | Silver medal. |
| Best violin, J. T. Kenney & Son, Dayton | “ |

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## COUNTY SOCIETIE'S REPORTS ON FIELD CROPS.

The only entry for premiums on field crops was for wheat. The premium was awarded to Mr. B. F. Reid, of Cedarville township, Greene county, who cultivated a field of seven acres on the farm of Mr. John Reid; a lot of "common second-rate land, sown to flax, then plowed, harrowed, and wheat-drilled in on the 16th of October, at the rate of one and one-half bushel to the acre." The product was 185½ bushels, or 26½ bushels to the acre. Mr. Reid itemizes the cost of the crop as follows:

| | |
|---|---|
| Plowing once | $10 50 |
| Harrowing twice | 4 00 |
| Drilling | 3 00 |
| Reaping | 7 00 |
| Binding and shocking | 8 00 |
| Hauling to the barn | 6 00 |
| Threshing, cleaning, and sacking | 20 00 |
| Total cost of cultivation | $58 50 |

To this should have been added the cost of the seed, and, to show what was the real net profit of the crop, a fair per cent. upon the capital invested in the land. These two items added, would probably run the cost to about $106 62. At this point we will leave the case for some farmer friend to make a showing of the profits.

At the annual meeting of the Society, held on the 6th day of January, 1862, the following premiums were awarded on field crops, to wit: R. Baker, of Avon, first premium on one acre of wheat, 33$\frac{17}{60}$ bushels.

*R. Baker's Wheat*—1861.

One acre of Kentucky white wheat entered for competition for premium offered by the Lorain County Agricultural Society, 1861.

The soil is a mixture of black loam and clay. The previous crops were, three years corn, and one crop of oats (in 1860). Commenced plowing August 15th, 6 inches deep, across the former plowing for oats, which was in lands one rod wide. Sowed broadcast, September 6th, 1½ bush. Kentucky white wheat to the acre; thoroughly harrowed with a pair of Scotch harrows; rolled it with a heavy roller; sowed 1 peck of herd's grass to the acre; harrowed it again; plowed out the old furrows, to take off surface water, leaving the lands about one rod wide, as in the previous oat crop; cut July 18th; hauled into barn July 24th; threshed August 8th. The grass injured the wheat crop to some extent, it being a full growth.

(Signed) R. Baker.

This is to certify that I measured one acre of R. Baker's wheat, and assisted to weigh the same, and found 33 bushels 17 lbs., at 60 lbs. per bushel.

(Signed) G. S. Phelps.

*State of Ohio, Putnam County.*

H. V. Watts, being duly sworn, says that he raised a crop of wheat the past season on his farm in Ottawa township, upon the land measured by J. L. H. Long, and that the quantity of wheat raised thereon was three hundred and ten bushels, making twenty-seven and five-ninths bushels per acre. This wheat was raised on bottom land that had been tended in corn twenty years; the soil is a block loam. The seed was sown about the 7th and 8th days of September, plowed in with corn by a shovel plow. The Mediterranean seed was used.

*Expense of Seed, Culture, &c.*

| | |
|---|---|
| Two and a half days' plowing with horse | $2 50 |
| Thirteen bushels seed wheat | 13 00 |
| Harvesting and threshing | 50 00 |
| Use of land | 33 75 |
| Total expense | $99 25 |
| Wheat estimated at one dollar per bushel, three hundred and ten bushels. | $310 00 |
| Net profit per acre | 18 69 |

Nov. 17, 1861. H. V. Watts.

We, the undersigned, do hereby certify that we measured a piece of ground tended in corn the present season by John and Kersey Raley, and found it to contain two acres and one rod; and that we helped husk and measured the corn that grew upon the same, and found it to be one hundred and fifty bushels and seventeen and two-third pounds of shelled corn.

Salathiel Morlan,
J. C. Green.

The soil on which my corn grew is a sand and loam, in parts mixed with gravel. It had been lying in grass for five or six years; was plowed about the first of April, from six to seven inches deep; was twice harrowed, and planted about the 15th of May with good seed, of a variety known as the "Kemble," or little "Gourd Seed" corn. A part of the ground had some manure from the horse-stable spread upon it before breaking it up. The corn was planted in hills about four feet each way, and was thinned so as to leave but three stalks in each hill; was tended three times with cultivator and once with plow; hoed once.

*Expense of Cultivation.*

| | |
|---|---|
| Hauling manure one day | $1 50 |
| Plowing ground | 3 00 |
| Harrowing, planting, &c. | 2 50 |
| Cultivating four times | 3 00 |
| Husking and cribbing | 3 00 |
| | $13 00 |
| To offset this, we may add 1,000 pumpkins | $10 00 |
| And fodder, over and above expense of saving | 2 00 |
| | $12 00 |

Kersey Raley.

R. Baker, first premium on one acre of corn, 118$\frac{40}{56}$ bushels.
Second premium on corn to A. R. Taylor, Elyria, 115$\frac{30}{56}$ bushels per acre.
A. R. Taylor, Elyria, first premium on one acre of oats, 78$\frac{19}{32}$ bushels.

William H. Chandler, to whom was awarded first premium on a crop of 124 bushels of Indian corn, raised on one acre of ground, says:

"Soil, sandy loam; no manure used; corn stubble; time of planting, 13th of May; kind of seed, yellow gourd seed. The ground was plowed 10 inches deep, harrowed well, furrowed out both ways, about 3 feet apart. About 10 pounds of seed used; cultivated with a double shovel plow; plowed four times; hoed three times."

Upson Bushnell, Esq., of Gustavus, Trumbull county, raised on one acre of his farm 109$\frac{42}{56}$ bushels of shelled corn. It was cultivated as follows, viz: 40 two-horse loads of swamp muck applied in the fall of 1860, and 35 loads of stable manure in the spring of 1861; plaster applied after planting; compost of hen manure and muck, a handfull in a hill—all at a cost of $13, including extra labor of planting.

Mr. A. C. Fuller, of Birtol, raised from two acres of his farm 12,012 pounds of corn in the ear. It was turf ground, without manure.

This is to certify that I raised a crop of corn this year, and the amount of ground is ten acres. I manured the ground, and plowed and harrowed, and drilled the seed in, two and a half feet apart, and ruled the same. The ground is black, loamy soil. I would say that I cultivated all alike, and measured one acre out of ten, and husked and measured the corn.

*Cost of Culture.*

| | |
|---|---|
| To plowing one acre | $1 00 |
| " harrowing " | 25 |
| " six loads of manure | 75 |
| " cultivating three times | 75 |
| " once through with shovel plow | 25 |
| | $3 00 |

E. R. Shook certifies that he raised a crop of corn on the land measured by John Hileman, and that he raised one hundred and twenty bushels per acre, by measurement in sealed half bushel, and the manner of cultivation as set forth above is correct.
E. R. Shook.

*Josiah Weikart's Corn Crop.*

Nov. 5, 1861.—This day surveyed and measured a field on which a crop of corn was husked and gathered this season by J. Weikart, and found the same to contain 2 acres of land. (Signed) Peter Zimmerman.

Affirmed and subscribed before me, this 5th day of November, 1861.
(Signed) N. P. Callahan, Justice of the Peace.

This certifies that the undersigned measured the produce of the above field, and found the same to be 60 bushels and 26 lbs. of corn per acre, weighing 63 lbs. per bushel, making in the aggregate 120 bushels and 52½ lbs.

(Signed) A. J. Haifley,
John Haifley.

Affirmed and subscribed before me, this 5th day of November, 1861.

(Signed) N. P. CALLAHAN, Justice of the Peace.

The field was clover and blue grass sod; plowed in the month of March; the corn was planted on the 24th day of May; the ground was marked out 3½ feet each way, and from 3 to 4 grains planted in a hill; the corn was cultivated with a corn cultivator, once in a row each way, and plowed twice with a single shovel plow, one round in each row, and the last time plowing three times in each row. There has never been any manure put on the field, nor was the corn plastered.

(Signed) JOSIAH WEIKART.

| *Expenses of Culture.* | DR. |
|---|---|
| Breaking up, 1½ days | $3 00 |
| Harrowing | 50 |
| Marking out | 50 |
| Seed | 25 |
| Cultivating and planting | 5 00 |
| Husking and gathering | 6 00 |
| | $15 25 |
| | CR. |
| 120 bushels and 52 lbs., at 50 cts. per bushel | $60 46 |
| 6 loads pumpkins | 6 00 |
| | $66 46 |
| Deduct expenses of culture | 15 25 |
| Net profit | $51 21 |

JOSIAH WEIKART.

*One acre of corn entered for competition by R. Baker, for premium offered by Lorain County Agricultural Society,* 1861.

The soil is a mixture of black loam and clay; subsoil clay; two previous (and only) crops, corn. Plowed May 15th, 8 inches deep, 10 inches wide, in lands one rod wide; thoroughly harrowed; marked across the lands, 3½ feet wide; planted with hoe, 4 rows on each land; "Hackberry" variety, average 5 kernels to a hill; cultivated both ways, with five-tooth cultivator, as soon as could see the rows; one week after, cultivated again both ways; June 25th to 29th, plowed with one-horse plow, and thoroughly hoed; after harvest, cut out all weeds. The wind caused the crop to lodge some, making it bad to harvest. Cut September 28th; husked November 1st; weighed November 4th.

(Signed) R BAKER.

This is to certify that I measured one acre of R. Baker's corn, and assisted to weigh the corn from said acre, and found 118 bushels 40 lbs., at 70 lbs per bush.

(Signed) C. N. WILLIAMS.

### *Statement of a crop of Corn raised by True Houtoon, of Union township, Champaign county, in the year* 1861.

The previous crop was corn; the soil is a black sandy bottom; no manure has been put on the ground for twenty-five years; the ground was broke up early in the spring, and seeded with the yellow "Anderson corn," 6 quarts to the acre; planted on the 16th and 17th days of May, in hills 3½ feet apart; plowed five times with a shovel plow; product 88½ bushels per acre.

| | |
|---|---|
| Cost of cultivation per acre | $5 03 |
| 88½ bushels corn, at 25c | 22 13 |
| Net profit | $17 10 |

By the same: Crop of corn raised on clay ground; previous crop corn; no manure; cultivated same as above; product,

| | |
|---|---|
| 72 bushels per acre, at 25c | $18 00 |
| Expense of cultivation | 5 03 |
| Net profit | $12 97 |

### *Statement of a crop of Corn raised by J. L. Zook, of Salem township, Champaign county, in the year* 1861.

The land upon which this crop was raised, is King-Creek Valley bottom; previous crop corn; plowed in April, about 8 inches deep, with Michigan double plow; harrowed before planting; furrowed about 3½ feet each way, and 4 stalks to the hill; planted 13th of May; the seed used was a mixture of Calico and Yellow; worked once with a harrow, and three times with shovel plow.

| | |
|---|---|
| Product per acre, 86½ bushels, at 25c | $21 58 |
| Expenses of cultivation | 4 03 |
| Net profit | $17 55 |

### *One acre of Barley, entered by R. Baker, for competition for premium offered by Lorain County Agricultural Society,* 1861.

The soil is sandy, and some stones; subsoil gravel and stones. The land has been in crops for several years, the grass seeds missing; the previous crop was wheat. The ground was manured heavily (say 20 tons per acre) in March; plowed 26th March, 7 inches deep; sowed broadcast, April 11th, 2¾ bushels "bald barley;" thoroughly harrowed twice over; cut July 16th; carried into barn July 18th; threshed 19th October. The drouth injured the crop some, causing it to dry up some before it was quite matured, or there would have been a good yield. (Signed) R. Baker.

This is to certify that I measured one acre of R. Baker's barley, and assisted to weigh the barley from said acre, and found 28 bushels 29 lbs., at 48 lbs. per bushel. (Signed) C. N. Williams.

E. T. Cox, being duly sworn, says that he raised a crop of oats upon one acre of land, measured by J. H. Cox, and that the quantity of grain raised thereon was 88 bushels, weighed, and the manner and price of culture was as follows: plowed April 4th; sowed 8th; cost per acre, plowing, $1; sowing and harrowing, 50c.; putting in barn, $1; threshing, $1 35.

(Signed) E. T. Cox.

J. H. Cox, being duly sworn, says that he raised a crop of oats upon one acre of land, measured by E. T. Cox, and that the quantity of grain raised thereon was 95 bushels, weighed (32 lbs. per bushel), and the manner and price of culture was as follows: plowed corn stubble April 2d; sowed on April 8th; cost per acre, plowing, $1; sowing and harrowing, 50c.; putting in barn, $1; threshing, $1 50. (Signed) J. H. Cox.

*One acre of Oats, entered for competition by R. Baker, for premium offered by Lorain County Agricultural Society,* 1861.

The soil is a mixture of sand and stones on a part of acre, the other being black clay-loam; subsoil gravel and stones, and hard clay. The land has been in crops for several years. Manured in March, about 20 tons per acre; plowed 28th March, 7 inches deep; sowed broadcast, April 8th, 4 bushels per acre; harrowed twice over, with a pair of Scotch harrows; cut 25th July; carried into barn July 27th; threshed October 19th. Injured some by "army worm." Variety, English Poland Oats. (Signed) R. Baker.

This is to certify that I measured one acre of R. Baker's oats, and that I assisted to weigh the oats from said acre, and found 54 bushels 29 lbs., at 32 lbs. per bushel. (Signed) C. N. Williams.

J. H. Cox, being duly sworn, says that he raised a crop of cane, upon one-fourth of an acre of land, measured by E. T. Cox, and that the quantity of molasses obtained was 87½ gallons, and the manner and price of culture was as follows: plowing, 25c.; harrowing, planting, &c., 20c.; working, $1 50; manufacturing. $2 50. (Signed) J. H. Cox.

J. H. Cox, being duly sworn, says that he raised a crop of cane, upon one-fourth of an acre of land, measured by E. T. Cox, and that the quantity of molasses obtained was 92 gallons, and the price and manner of culture was as follows: plowing, 25c.; harrowing and planting, 20c.; the seed being raked till it sprouted; working, with plows and hoe, five times, $1 50; manufacturing, $3 00.

(Signed) J. H. Cox.

*Statement of a crop of Timothy Seed.*

Sept. 18, 1861.—I sowed a crop of wheat in the fall of 1859, and sowed the timothy seed and cut the wheat in 1860, and the timothy laid over till this year, and I cut one acre, and threshed and cleaned it, and measured in a sealed half bushel, and weighed the same, and the weight was 45 pounds to the bushel. The ground was black loamy soil, very rich.

### *Cost of Culture.*

| | |
|---|---|
| Plowing 1 acre | $1 00 |
| Harrowing 1 acre | 25 |
| Cutting the seed | 50 |
| Hauling and threshing | 1 00 |
| Cleaning the seed | 50 |
| | $3 25 |

E. R. Shook certifies that he raised a crop of timothy on the land measured by John Hileman, and that he raised thereon 8 bushels weight or measurement per acre, in sealed half bushel, and that the manner of cultivation, as set forth above, is correct. E. R. Shook.

### *Statement of a crop of Onions (two square rods), raised by David R. Cochran, of Harrison township, Champaign county, in the year* 1861.

The ground was a stiff blue grass sod, never before cultivated; is a black bottom; manured by stock in pasture, and one-third of a two-horse wagon load of well rotted chip manure, put on after the ground was thrown up into a high bed; seeded with between one and two ounces of the large red annual onion seed; drilled 14 inches apart, and thinned out, leaving the stalks from 3 to 4 inches apart; seeded the middle of April, and gathered the last of October.

| | |
|---|---|
| Product, 8¼ bushels, marketed at 60c | $4 95 |
| Expenses of cultivation | 2 00 |
| Net profit | $2 95 |

To Mr. John A. Barnett, of Yellow Springs, was awarded the premium on the Potato crop. He cultivated one-half acre, dropping the seed in furrows—furrows three and a half feet apart, and seed dropped two feet apart; put upon each hill before covering a handful of rotten straw, then covered with a shovel plow, throwing a furrow up from each side of the row; during the growth plowed twice between the rows with shovel plow, the first time hoeing and hilling up slightly. Product of the half acre, 93 bushels; variety, White Neshannock.

### *Statement of a crop of Potatoes.*

Eliphas Burnham, being first duly sworn, says that he raised the season past, on the one-fourth of an acre of ground, measured by Lucas Burnham, 82 bushels and 37 pounds of potatoes, of 60 pounds to the bushel. Said potatoes were of three different kinds, to wit: the Neshannock, the Dover, and the Black potato.

*Expense of raising the crop.*

| | |
|---|---|
| Plowing, harrowing and planting | $2 00 |
| Plowing and hoeing three times | 3 00 |
| Digging and putting in cellar | 3 00 |
| Amount of seed, four bushels at 20c | 80 |
| | $8 80 |

Soil, a dark loam; planted about the first of May; ground marked off in rows three feet apart; potatoes drilled in, from eighteen inches to two feet apart, and covered with a plow. No manure put on.

Have raised potatoes on the field every year for some twelve years; every second or third year put on at the rate of say twenty loads of stable manure to the acre; was manured last year. ELIPHAS BURNHAM.

The Lake County Agricultural Society the past year appointed a committee from the Board to examine field crops, instead of requiring each competitor to procure certificates, affidavits, &c.

That committee, at the annual meeting, made the following report:

| | | | | | |
|---|---|---|---|---|---|
| First premium | to | A. Greensit, of Mentor | on acre wheat, | 33 bushels. | |
| Second | do | L. Cram, of Madison, | do | 25 | do |
| First | do | Harrison Carpenter, of Mentor, | on acre corn, | 156 bush. ears. | |
| Second | do | B. B. Park, of Painesville, | do | 120 | do |
| First | do | M. L. Root, do | on orchard of 50 trees and over. | | |
| First | do | Asa Gurney, of Mentor, | on acre potatoes, | 274½ bu., Peach Blows. | |
| Second | do | Nelson Norton, of Perry, | do | same quantity. | |
| First | do | G. S. King, of Madison, | on acre clover hay, | 4000 | lbs. |
| Second | do | A. R. Daniels, of Mentor, | do | 3800 | do |
| First | do | Wm. Dunbar, do | timothy, | 8000 | do |
| Second | do | P. Parmlee, do | do | 6000 | do |
| First | do | Edwin Loomis, do | barley, | 50 bushels. | |

GEO. ANDERSON,
PHILANDER PARMLEE,
NELSON NORTON,
*Committee.*

Dec. 12, 1861.

Mr. C. G. Beardsley, of Newton, raised fifty bushels of barley on one acre of his farm, which was cultivated as follows: turf fallowed in 1860, and a crop of corn taken off, without manure; April 25th and 26th it was plowed, seed sowed broadcast, and twice harrowed.

Joseph Noyes, of Morgan county, was awarded first premium on a crop of turnips, raised on one-fourth of an acre (amount raised, 84 bushels). He makes the following statement:

"Soil, sandy loam; fourth crop—first, potatoes; second, Hungarian grass;

third, wheat. Ground plowed in the fall, after the wheat came off; planted to apple seed; cultivated until the 25th of July; turnip seed sown, raked in. Turnips raised, 84 bushels."

John Bingman, of Morgan county, was awarded first premium on a crop of sweet potatoes, raised on 41⅛ rods of ground. He makes the following statement:

"On the above lot of ground I raised fifty-two bushels of sweet potatoes, without manure of any kind, it being sand loam, river bottom."

The Morrow County Agricultural Society awarded premiums on the following field crops, for the year 1861:

First premium on 5 acres of corn to W. T. Sherman, 58½ bushels per acre, raised on black loam elm bottom land, second crop, plowed deep with a steel plow, planted 4x4 feet, planted the 27th of May, with a large white variety of corn, averaging some 6 or 7 stalks to the hill, tended once each way with a five-tooth cultivator, and followed each time with a single shovel, once in a row; afterwards it was plowed each way twice in a row, and hoed after each plowing. Properly attested to.

First premium on one acre of corn to Wm. G. Beatty, 103$\frac{24}{70}$ bushels on one acre, raised on second bottom, black loamy soil, being the first grain crop on said ground; broke in May, with a common plow, planted the first day of June, with a yellow variety known here as the Wallace corn; planted in hills, 3½ feet apart each way, 3 to 5 stalks to the hill; worked through 3 times, once with a cultivator, and plowed twice. Properly attested.

Second premium on one acre of corn to Wm. T. Sherman, 71 bushels on one acre, black elm bottom loam, broke quite deep; the third crop of corn in succession; planted the 18th of May, in hills 4 feet apart, with a yellow variety of corn, some 6 or 7 stalks to the hill; tended each way, first with a five-tooth cultivator, afterwards plowed with a single shovel each way, and hoed.

## ABSTRACT OF REPORTS OF COUNTY SOCIETIES.

| County. | Place of holding Fair | Time of holding Fair | Receipts. | Expend'res. | President. | Secretary. | Treasurer. |
|---|---|---|---|---|---|---|---|
| Adams | | | | | | | |
| Allen | Lima | Sept 26, 27, 28 | $473 12 | $472 92 | J. B. Roberts | C E. Griffith | G. W. Overmyer. |
| Ashland | Ashland | Oct 9, 10, 11 | 930 29 | 742 15 | | W B. McCarty | |
| Ashtabula | Jefferson | Sept. 3, 4, 5, 6 | 1,180 71 | 1,403 46 | C. Dodge | H. Loomis | W. H Burgess. |
| Athens | Athens | Oct. 1, 2, 3 | 899 48 | 957 21 | M. M. Greene | H. T. Brown | N. H. Van Vorhes. |
| Auglaize | | | | | | | |
| Belmont | St Clairsville | Sept. 23, 24, 25 | 992 25 | 741 81 | J M. Mitchell | J. A. Harris | W. R. Retts. |
| Brown | Georgetown | Sept. 3, 4, 5, 6 | 1,084 54 | 1,002 17 | J. Dugin | J. H. King | F. J. Philo. |
| Butler | Hamilton | Oct 1, 2, 3, 4 | 4,576 82 | 2,337 82 | F. Andersen | | G. W Tapscott. |
| Carroll | Carrollton | Oct. 1, 2, 3 | 539 04 | 491 73 | | W. McCoy | J. Moody. |
| Champaign | Urbana | Oct 1, 2, 3, 4 | 2,226 55 | 2,200 30 | T. K. Thompson | J. T. Zombro | J Earsom. |
| Clarke | Springfield | Oct. 1, 2, 3, 4 | 2,157 07 | 1,966 37 | Wm. Hunt | J. Howell | Wm. Field. |
| Clermont | Olive Branch | Sept 3, 4, 5, 6 | 1,271 64 | 1,140 90 | J Kugler | W. C. Pinkham | G. W. Hulick. |
| Clinton | Wilmington | Sept 4, 5, 6 | 930 53 | 846 38 | B. W Fuller | L. C Walker | W. Crumley. |
| Columbiana | New Lisbon | Sept. 25, 26, 27 | 2,012 87 | 1,703 97 | W. Hostetter | T. G. Huston | B. W. Pritchard. |
| Coshocton | Coshocton | Oct 9, 10, 11 | 1,840 94 | 798 94 | J. M. Burt | C. H. Johnson | M. Johnson. |
| Crawford | Bucyrus | Sept. 18, 19, 20 | 774 31 | 576 22 | S. Myers | J. Hopley | G. Quinby. |
| Cuyahoga | Cleveland | Oct. 1, 2, 3, 4 | 1,892 91 | 2,974 74 | C. S. Gates | B. H. Stair | J. Hurst. |
| Darke | Greenville | Oct. 2, 3, 4, 5 | 1,283 97 | 1,268 63 | N. Arnold | J. E. Matchet | J. F. Burch. |
| Defiance | Defiance | Oct. 2, 3, 4 | | | | | |
| Delaware | Delaware | Sept. 17, 18, 19, 20 | 1,484 54 | 1,797 73 | N. Dustin | J. S. Jones | C. Armstrong. |
| Erie | | | | | | | |
| Fairfield | Lancaster | Oct. 9, 10, 11 | 1,928 90 | 1,746 74 | J. V. Pearse | P. B. Embich | J. C. Weaver. |
| Fayette | Washington | Sept. 4, 5, 6 | 563 76 | 635 00 | G Terrill | C. A. Palmer | M. Draper. |
| Franklin | Columbus | Sept. 3, 4, 5, 6 | 2,114 71 | 2,186 34 | J. Forsman | C. S. Glenn | J. M. Pugh. |
| Fulton | Ottokee | Sept. 18, 19, 20 | 463 25 | 398 04 | D. W. H. Howard | R. A. Franks | C. B. Verity. |
| Gallia | No Fair | | | | A. P. Rodgers | J. R. Calahan | J. C. Neal. |
| Geauga | Burton | | 911 00 | 911 00 | P Hitchcock | J. S. Cook | G Broughton. |
| Greene | Xenia | Oct. 9, 10, 11 | 1,542 11 | 1,463 36 | D. McMillan | D. P. Jefferies | J. B. Allen. |
| Guernsey | Cambridge | Oct. 10, 11 | 204 05 | 257 22 | T. Oldham | E. J. Albright | Wm. Smith. |
| Hamilton | | | | | | | |
| Hancock | Findlay | Sept. 26, 27, 28 | 754 07 | 580 37 | I Green | D. B. Beardsley | G. W. Galloway. |
| Hardin | Kenton | Oct. 2, 3, 4 | 255 00 | 200 00 | J. A. Elder | R. H. McConnell | S. Watt |
| Harrison | Cadiz | Oct. 2, 3, 4 | 2,135 17 | 1,879 23 | E. Clark | J. M. Robinson | J. B. Barrett. |
| Henry | | | | | | | |

## ABSTRACT OF REPORTS OF COUNTY SOCIETIES—*Continued.*

| County. | Place of holding Fair. | Time of holding Fair. | Receipts. | Expend'res. | President. | Secretary. | Treasurer |
|---|---|---|---|---|---|---|---|
| Highland | Hillsboro' | ........ | ........ | ........ | J. J. Jolley | S. H. Woodrow | S. E. Hibben. |
| Hocking | Logan | Oct. 2, 3, 4 | $265 99 | $269 52 | F. A. Gibbons | J. M. Floyd | J O. Rochester. |
| Holmes | Millersburg | Oct. 9, 10, 11 | 250 00 | 250 00 | R. Wheaton | B. C. Brown | Jos. Hebrew. |
| Huron | Norwalk | Oct. 2, 3, 4 | 1,607 62 | 1,121 71 | G. Boalt | G. W. Knapp | C. N. Preston. |
| Jackson | Jackson | Oct. 3, 4 | 552 97 | 268 50 | W. S. Shellinger | J. A. Sell | J. H. Stephenson. |
| Jefferson | Steubenville | Sept 25, 26, 27 | ........ | ........ | ........ | ........ | ........ |
| Knox | Mt. Vernon | Oct 9, 10, 11 | 1,584 31 | 965 56 | J M Byers | W. B. Russell | C. S. Pyle. |
| Lake | Painesville | Sept. 19, 20, 21 | 972 73 | 871 74 | S. Warren | M. S. Root | C. D. Adams. |
| Lawrence | ........ | ........ | ........ | ........ | ........ | ........ | ........ |
| Licking | Newark | Oct. 2, 3, 4 | 2,545 19 | 1,769 78 | Wm. Mahoim | A. Adair | W. M Cunningh'm |
| Logan | Bellefontaine | Sept. 24, 25, 26, 27 | 1,110 26 | 1,006 32 | G. Folsom | M. Steen | E. Patterson. |
| Lorain | Elyria | Sept. 25, 26, 27 | 1,360 20 | 1,073 66 | W. B. Gates | R G. Horr | R. G. Horr. |
| Lucas | Toledo | Sept. 24, 25 | 1,056 00 | 645 00 | D. E. Gardner | ........ | G. Norton. |
| Madison | London | Sept. 4, 5, 6 | 721 06 | 606 76 | P. W. Taylor | H. Toland | J. Peetrey. |
| Mahoning | Canfield | Oct. 1, 2, 3, 4 | 1,971 07 | 1,921 08 | George Pow | F. C Nesbit | H. Hoover. |
| Marion | Marion | Sept. 25, 26, 27 | 318 81 | 314 02 | E. Conly | H. M. Ault | A. D. Mathews. |
| Medina | Medina | Oct 10, 11, 12 | 852 97 | 412 52 | J. Seeley | H. G. Piper | S. J. Hayslip. |
| Meigs | ........ | ........ | ........ | ........ | ........ | ........ | ........ |
| Mercer | ........ | ........ | ........ | ........ | ........ | ........ | ........ |
| Miami | Troy | Sept. 24, 25, 26, 27. | 2,152 96 | 2,000 00 | D. French | G W. Morris | B. S. Kyle. |
| Monroe | Woodsfield | Sept 18, 19, 20 | 534 26 | 532 72 | S P. Jones | J. R. Morris | J. M. Kirkbride. |
| Montgomery | Dayton | Oct. 2, 3, 4 | 360 17 | 728 00 | T. Brown | T. Schaeffer | D. H. Dryden. |
| Morgan | McConnelsville | Sept. 25, 26 | 802 65 | 802 65 | J. B. Stone | H. Dunsmore | F. Sill. |
| Morrow | Mt. Gilead | Oct. 2, 3, 4 | 953 10 | 1,279 98 | G. W. Hiskett | J. T. Beebe | S Thomas. |
| Muskingum | No Fair | ........ | 521 70 | 399 04 | V. Best | F. A. Leborn | Jas Buckingham. |
| Noble | Sarahsville | Oct. 3, 4 | 177 04 | 165 04 | Wm. J. Young | J. Pettay | G Salladay. |
| Ottawa | Port Clinton | ........ | 191 96 | 119 30 | ........ | T. J. Kirk | Jas. Hollinshead. |
| Paulding | ........ | ........ | ........ | ........ | ........ | ........ | ........ |
| Perry | ........ | ........ | ........ | ........ | ........ | ........ | ........ |
| Pickaway | Circleville | Sept. 25, 26, 27, 28 | 883 00 | 1,279 98 | G. W. Gregg | O. E. Niles | J. Boyer. |
| Pike | ........ | ........ | ........ | ........ | ........ | ........ | ........ |
| Portage | Ravenna | Sept. 18, 19 | 486 25 | 498 82 | T. Gorby | J. C. Harmon | W. W. Hinman. |
| Preble | Eaton | Sept. 16, 17, 18, 19 | 1,230 69 | 1,211 49 | H. W. Dooley | J. Eastman | J P Brokins. |
| Putnam | Ottawa | Oct. 2, 3, 4 | 702 62 | 675 88 | J. Maidlaw | H. V. Watts | D. B. Pocock. |
| Richland | Mansfield | Oct 1, 2, 3 | 1,086 07 | 221 23 | B. S. Runyan | J. S. Crall | H. P. Davis. |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Ross ........ | ........ | ........ | ........ | ........ | ........ | ........ | ........ |
| Sandusky ........ | Fremont........ | Oct. 2, 3, 4 ........ | 758 70 | 837 37 | D. Capper........ | O. W. Vallette........ | T. Clapp. |
| Scioto........ | ........ | ........ | ........ | ........ | ........ | ........ | ........ |
| Seneca........ | Tiffin........ | Oct. 2, 3, 4 ........ | 2,577 64 | 1,652 05 | L. Baltzell ........ | J H Pittinger........ | L Stem. |
| Shelby ........ | Sidney........ | Oct. 1, 2, 3, 4........ | 879 25 | 451 75 | J. A. Wells ........ | S A Leckey........ | J. Duncan. |
| Stark ........ | Canton........ | Oct 2, 3, 4 ........ | 2,754 62 | 2,548 89 | H. Raynolds........ | M. Raynolds ........ | J. P. Rex. |
| Summit ........ | Akron........ | Oct. 1 2, 3, 4 ........ | 1,951 54 | 1,308 98 | P. C. Cruthers........ | J Mathews........ | J. R. Buchtel. |
| Trumbull ........ | Oak Grove ........ | Sept. 23, 24, 25 ........ | 1,134 91 | 634 91 | J. Robbins ........ | J. S. Fuller........ | B. N. Robbins. |
| Tuscarawas ........ | No Fair........ | ........ | ........ | ........ | B. Downy........ | G. Welty........ | U. C. Deardoff. |
| Union ........ | Marysville ........ | Sept. 25, 26, 27 ........ | 592 76 | 453 78 | J. W. Robinson ........ | C. S. Hamilton........ | E L. Reynolds. |
| Van Wert ........ | ........ | ........ | ........ | ........ | ........ | ........ | ........ |
| Vinton........ | ........ | ........ | ........ | ........ | ........ | ........ | ........ |
| Warren ........ | No Fair........ | ........ | 101 97 | 81 65 | E. Carpenter........ | G. W. Frost ........ | J. Thompson |
| Washington ........ | No Fair........ | ........ | 716 87 | 614 97 | George Dana........ | S O. Skinner........ | O K Leonard. |
| Wayne ........ | Wooster........ | Oct. 1, 2, 3........ | 1,593 62 | 1,289 42 | A. Brown........ | James Johnson ........ | J McClellan. |
| Williams........ | Bryan ........ | Oct. 2, 3, 4 ........ | 584 83 | 594 16 | J. Dillman ........ | J. Yourse........ | H. Byers. |
| Wood ........ | ........ | ........ | ........ | ........ | ........ | ........ | ........ |
| Wyandot........ | ........ | ........ | ........ | ........ | ........ | ........ | ........ |

# ABSTRACT OF REPORTS OF COUNTY SOCIETIES.

## ALLEN COUNTY.

The second annual exhibition of the Allen County Agricultural Society, was held on the fair grounds, near Lima, September 26th, 27th and 28th, A. D. 1860.

Notwithstanding the weather was extremely cold and windy during the fair, a large number of people were in attendance, many perhaps, to see Mons. Blondin, perform his astonishing feats on the tight and slack rope. The managers have made extensive improvements the past season; that of enlarging halls, erecting stalls and sheds for horses and cattle, making a supply of pens for sheep and swine, and sundry other improvements, all of which seemed satisfactory to all.

The success of the exhibition was equal to the expectation of the most sanguine. There seems to be a steady and growing interest manifested in every department. of Agriculture in this county, since the organization of our Society.

The quality of stock on exhibition was far above that of the preceeding year. The quality of hogs, sheep and cattle was especially good, and entries numerous. The ladies' department was all that could be desired, and the Society is greatly indebted to them for their untiring energy and perseverance in maintaining a department which is so necessary to the success of the Society.

The number of entries for the year, 437. Number of members, 175

## ASHTABULA COUNTY.

The Ashtabula County Agricultural Society, held its fifteenth annual fair at Jefferson, September 3d, 4th, 5th and 6th, A. D. 1861.

Heretofore, but three days were occupied for the holding of the fair, but the growing interest, since the organization of the Society, rendered the time too short, to give all classes an impartial and full examination, hence, the fourth day was added.

The weather for the first two days proved inauspicious and rainy, but the remaining two days, gladdened all interested, with good weather, and a good time, much surprising many, who anticipated a slim show, owing to hard times and war engagements. But notwithstanding all these, the people turned out, making the receipts at the gates, much larger than at the preceding fair. Yet there was a falling off of entries, from those of last year, some two hundred and ninety, but they were mostly on articles that would not materially detract from the interest of the exhibition. The number of members enrolled for the year, 161.

In regard to members of county and local Agricultural Societies the idea seems to be farcical, for as a general rule, persons only become members for the sole purpose of gaining the privilege to enter as many articles or animals as wil insure at least one hundred per cent. or more, by way of premiums, otherwise taking no interest whatever in the management and welfare of the Society; and when a few, who are members of the board, have taken the responsibility of making the rules, regulations and arrangements, and do all the work, the only duty of the so called members, seems to be, to grumble at what "might have been different," and what "ought to have been done." The effect of Agricultural and Industrial Societies upon a community and country tends to wealth, good taste and refinement, when properly conducted. Then why, should not at least, every member of such Societies take an active interest in conducting them?

We believe our Society, though always struggling under some difficulties, has accomplished and brought about marked improvements in every department of industry, and especially has it improved our flocks and herds Since its organization the cattle breeders have turned their attention from the common or mixed breeds of big-horned, big-headed, sharp-boned cattle, to the more profitable and fine proportioned "Short-Horns." In horses, the "common plugs" are being put aside for those possessing both symmetry and endurance.

The old fashioned swine, that were wont to be yoked by "tying a knot in the ends of their tails," have long since taken their last squeal, and the easily fattened and beauty of a "Suffolk," or the more stately and well proportioned "Chester White," now reigns supreme at the trough. Sheep have been greatly improved, both in carcass and quality of wool.

The orchard, farm and garden are looking and doing better, by improved husbandry Yet, underdraining, the great source for improving our hard, tenacious, clayey soil, is but little resorted to.

The greatest lack in the exhibition, the present year, seemed to be in the mechanical and manufacturing departments, fruits and vegetables. This county is not an extensive manufacturing county, but the show of mechanical and manufactured articles, might have been much more fully represented. In fruits, the crop was short, and necessarily a moderate exhibition. Vegetables were abundant in growth, but the fair was held too early for a good display. The potatoe crop was large, but had rotted to a great extent, occasioned in part by the worm.

The ladies' departments were well and tastefully filled; much credit is due them for the becoming decorations of the hall, the fine display of domestic carpets, ruggs, flannels, linens, etc., etc., together with fancy and plain needlework, natural flowers and a sprinkling of the fine arts. The musical department was entirely wanting.

In hogs and poultry there was but few on exhibition.

The competition in horses and cattle was quite animated, and a large proportion were very excellent animals, doing much credit to the fair. On the whole, the fair was a success.

The crop of wheat, corn and oats in the county was generally good.

Since August, the fair grounds have been occupied as a camp for the Twenty-Ninth Regiment O. V. U. S. M. The ticket office converted into a hospital, the exhibition hall, and some of the horse sheds used as camp kitchens. The horse and cattle sheds, not occupied as cook rooms, and the sheep and hog pens, were all demolished by the soldiers, and a greater part of the seats and the fence surrounding the grounds met a similar fate. The shelves and tables in the hall are in a sorry condition to hold and show off fineries, after being used so extensively as pantry shelves, by unexperienced, and not altogether tidy cooks.

## ATHENS COUNTY.

Owing to the stringency of the times, and the depressing influences of the war, but few county fairs were held in this part of the State, and when late in the season, it was determined to announce the annual exhibition of this Society, in this county, it was not without many misgivings as to the result.

The friends rallied cheerfully to this call for volunteer labor, for the preparation of the grounds, and the fair was held on the 1st, 2d and 3d days of October, and attended with the happiest results.

The weather proved fine, and the attendance exceeded the expectation of the most hopeful. The receipts, although not so large as on former occasions, were yet largely in excess of the expenditures, and proved nearly sufficient for the payment of the debt of this Society.

## BELMONT COUNTY.

There was no competition for premiums for crops, or improvements in agriculture.

The Fair held at St. Clairsville in October last, succeeded beyond our most sanguine expectations, and after defraying all expenses, there is left in the treasury a balance of nearly $50; and should times continue even as bad as at present, it is thought our society will continue to flourish. Our membership book foots up 425 in number, which is about 200 less than last year.

I am unable to give an estimate of each crop raised. The average yield per acre is, in my opinion, of wheat about 7 bushels, oats 20, barley about the same, corn 30 bushels; rye, buckwheat, &c., are raised, but not in sufficient quantities to be considered good crops. Rye grown on my farm this season yielded about 17 bushels per acre, and buckwheat 12 bushels. Hay is thought to be less than half an average crop—say about three-fourths of a ton per acre. With the exception of this article of feed and straw, we have an abundant supply for home consumption, and some for sale. Oats suffered about harvest from the depredations of a black worm, about 1½ inches long, resembling somewhat the caterpillars that collect on fruit trees occasionally. In some localities large quantities of the oat was shelled off the heads, after the grain had been cut and left in the swath to cure. Corn was somewhat injured by drouth in the early part of the season; the crop was, I think, materially lessened in bushels from this cause.

Our winter so far has been mild, and our stock feeds finely and looks well.

Wheat never looked better at this season of the year, nor had a better set in the ground; and should we not have wet weather, with frost, in March, it will come into the growing season next spring very healthy and vigorous.

## BROWN COUNTY.

The Twelfth Annual Fair of the Brown County Agricultural Society, for 1861, was held at Georgetown (Tuesday to Friday inclusive) on the 3d, 4th, 5th and 6th days of September.

On account of the troubles and distress consequent on the "Great Rebellion," and in addition thereto, the partial failure of the crops, the Board hesitated for some time about *risking* show for the current year. Assurances from various parts of the country that success was reasonably certain, and that it was not probable that either of the Independent Societies—of Ripley or Fincastle—in this county would hold a Fair, determined the Board to make the usual effort. Our expectations were more than realized. Although our membership was not quite so large, nor the entries so numerous as we have sometimes exhibited, a very large majority of the stock and articles shown was of a superior quality. We paid all expenses, and almost the balance of the debt of the society. Where the success of almost every measure is estimated by means of the potential dollar, we feel good reason to be gratified at the result.

| | |
|---|---|
| Number of members this year | 311 |
| Do of entries | 659 |

Our grounds, improvements, &c., have been heretofore described. The horse show was splendid; the cattle show by far the best ever exhibited in the county; hogs and sheep tolerably well represented. Floral Hall was magnificently decorated by the young ladies; but better still, was well filled with the choice products of the land, and the handiwork of our wives and daughters. Needle-work, flowers, jelly, bread and butter, preserves, and canned fruit in vast quantities, attest the eagerness of the fair exhibiters to prove their good housewifery, if not to assist in the "removal of the deposits."

Wheat very much injured by the fly—perhaps not half a crop; corn hardly two-thirds; tobacco below an average—has been selling at $7 to $10 per 100 lbs.; oats very light; hay good; fruit almost an entire failure, except peaches, which, for the limited number of trees left in the country, was a fair crop; potatoes a very moderate crop. The vintage is becoming a very important part of the agriculture of this county, and I labored to procure some reliable statistics of this branch for the present year, but failed. We raise large quantities of tobacco every year, but I believe the State Board put this article under ban.

## BUTLER COUNTY.

The President of the Butler County Agricultural Society respectfully submits the following report of the doings of said society for the past year:

Notwithstanding the discouragements presented by the distracted condition of the country, our Board of Directors deemed it advisable to keep up our regular exhibitions, not only because the law required it, but because it was believed that any serious interruption in our proceedings would embarrass the Board in their future operations.

The result of our Fair showed the fact, that while our people were intensely interested and active in doing what patriotism demanded of them for the support and integrity of the Union, still they did not forget the duty of sustaining the agricultural interest of our own county.

The exhibition was highly respectable, the attendance unusually good under the circumstances, and the Fair, financially, a success.

The report of the Treasurer shows that the premiums awarded amounted to the sum of $1165; that our society is out of debt (possessed of good grounds, containing about thirty acres, which is thoroughly improved by substantial and durable buildings, stalls for horses and cattle), and that there is in the treasury the sum of $2239.

The state of progress in agriculture during the past year has been regular, although not so rapid as usual, because of the military excitement. Unusual attention and activity is being manifested by those who remain at home, in the effort to keep up the regular products of the farm, so that no falling off shall take place in consequence of the withdrawal of a large portion of the agricultural force of our county.

The past season has not been so productive as usual. The crop of wheat did not exceed two-thirds of a crop. The corn has also fallen short from ten to fifteen per cent. Apples were almost an entire failure, the loss of which were, in some degree, compensated by an unusually fine crop of peaches and pears and small fruits.

## CARROLL COUNTY.

In compliance to your instructions—of the date of November 12, 1861, published in *Ohio Cultivator*—the Carroll County Agricultural Society submit the following report of its doings for the year 1861:

List of premiums awarded as follows: First Department—Total of horses, 170 entries; premiums awarded, $38 88. Total of cattle, 48 entries; premiums awarded, $35.47. Total of sheep, 96 entries; premiums awarded, $51.15. Total of hogs, 6 entries; premiums awarded, $7.33. Poultry (per coop and pairs), 5 entries, premiums awarded, $4 00. Second Department—Total, 155 entries, premiums awarded, $79 66. Total of First Department, 325 entries; premiums awarded, $181.83. Total premiums awarded, 1861, $261.49; total entries, 470.

The statement of competitors for premiums on crops are very vague, the manner pursued being the ordinary method of tillage. Very little attention paid to latest improvements in tillage in Carroll county; reason, perhaps to some degree, for want of sufficient inducement by our Board in offering large premiums on such things. But the greatest, and perhaps the main reason, our people are not so much an agricultural, as a cattle and sheep-growing people. Land not so well adapted to the former as the latter.

That all persons should have an opportunity to exhibit animals successfully for premiums, the Board prohibited all animals from the regular classes, when such animal took first premium last year, but let such animals come in competition with all animals of that species on exhibition, under title of Sweepstakes.

Agreeably to the regulations of State Board, election for officers will be held January 25, 1862, instead of last day of Fair, as heretofore. Would it not be better to elect officers on last day of Fair, and have officers elect to enter upon their duties shortly after the annual Agricultural Convention—say first Monday of February? This would secure a full attendance of members at election without inconvenience; and it would allow the old, or former Board ample time to settle up all of the previous year's business.

The number of members for 1861 is 268. The usefulness of the society is apparent to every reflecting and observing citizen of the county; yet it doubtless would be more so, if more of our citizens deemed the society a means of improvement in tillage and stock growing, rather than a medium of getting a small return in dollars and cents, by way of premiums. However, this is not any fault of the system or the society; but the fault lies in the short-sighted avarice of some whose age and experience should have, ere this, taught them better sense. Agricultural societies should as far as possible be made self-sustaining institutions, especially in these times, when our public treasury is bleeding at every pore; yet we should not, in our attempt to save a few dollars, cripple the agricultural operations of the country.

The principal crops raised in this county are: Wheat, rye, oats, corn, buckwheat, barley, potatoes, and grass. The average yield per acre, or the amount raised, I am not able to give. The annual return to the Auditor by the assessors, which are annually returned to the State Department, affords the most accurate data for estimates, and to which your Board is referred.

The past season has presented nothing of a very striking character. Weevil and fly have been hitherto the most destructive insects in this county, but during the last year they have been less so than in former years.

Deeming I have given you all the facts that are interesting, and having complied with the requisition of the statute, I have only to say you will much oblige by certifying the same, that we may avail ourseves of the portion due from the county treasury before our annual election, so that we may settle up all business of last year.

## CHAMPAIGN COUNTY.

The eleventh annual fair of the Champaign County Agricultural Society, was held on the Society's grounds, near Urbana, on the 1st, 2d, 3d and 4th days of October, 1861. Weather favorable. The attendance was not so large as the year previous, but much better than was anticipated. The exhibitions were very good, and demonstrated the usefulness of the Society, in the manifest improvement in all the departments. The principal crops of this county are, wheat, corn, oats, rye, barley, hay and potatoes, to all of which the past season was unfavorable, especially, wheat, corn and potatoes. The fruits of the county are, apples, peaches, grapes and berries, the two first of which were almost a total failure this season.

The number of members this year, is 1,143; the number of entries, 1,567; the amount of premiums awarded, $886 50.

## CLARKE COUNTY.

Our ninth annual fair was held on the 1st, 2d, 3d and 4th days of October, 1861. The first day was devoted to the trial of plows and implements, with a spirited contest among our home manufacturers only. All awards on stock this season, being confined to animals owned in the county, a large competition drawn from adjoining counties, by our heretofore open premium list, was cut off Still all classes of stock were well represented, and mostly so, with the department of manufactured articles. The loss of the last fruit crop, left us with almost bare shelves, but of vegetables and farm products, seldom has there been a better display.

The Society has, within the past year, completed payment of the additional ten acres bought during 1860, now owning twenty-nine acres enclosed, of which the county assisted in the purchase of the first nineteen acres bought.

The use of the grounds were given to the Forty Fourth Regiment, during September and October, and during the fair they were confined to the new addition to the grounds. This created increase of expenses during the fair, and in cleaning up and repairing after their departure. The sum remaining in the treasury, after payment of premiums, and all necessary expenses of the Society, for the current year, was donated for the use of Ohio Volunteers, and a committee appointed to invest the same in yarn, have socks and mittens knit, and send them to any point where they might find there was most need.

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## CLERMONT COUNTY.

The Clermont County Agricultural Society, held its thirteenth annual fair, at Olive Branch, on the 3d, 4th, 5th and 6th days of September, 1861.

Owing to the peculiar state of the country, its depressing influence upon the public feeling, and the absorbing interest taken in military affairs by a large portion of our citizens, it was thought by many during the summer that the prospect of our usual amount of exhibitions was not flattering, and that a fair this fall would be unsuccessful. The board of officers and managers, however, though partaking somewhat of the general feeling of doubt, decided to make the usual arrangements for the occasion, and having put the grounds in good repair, and having enlarged and made a decided improvement in the arrangement of Floral Hall, waited with hope for the day. The result exceeded the expectations of the public, and was very gratifying to the members of the Society. All circumstances considered, the fair was a success.

All the different classes of articles were represented, and gave the repeated evidence of the continued interest and improvement in the productive industry of our citizens.

The exhibition of horses, presented nothing new, in the character of "blood." As was remarked in last year's report, the tendency toward the breeding of the more heavy and serviceable horses is still increasing, and was plainly shown this year by an unusual number of entries of draught horses and horses for all purposes.

Of jacks and mules, the usual number were shown, and gave fair evidence of improvement in this useful animal.

Of cattle nothing new was shown. The number was not large, but the specimens were fair. The "Short-Horn," is still considered the standard of excellence.

In sheep some fine specimens were exhibited, but this county gives less attention to this class of animals than it once did, one of the prominent obstacles to sheep husbandry, being dogs.

Swine were as usual very well represented. Of the distinct breeds, the "Suffolk," has for the last few years been prominent. Of late, some "Chester Whites," have been introduced, and by many are considered much superior to the "Suffolk."

The show of poultry, was fair this year, showing that the interest in this class has not been entirely lost.

A very creditable display of grains and seeds, vegetable and farm products, was made. A continued improvement in the style and finish of agricultural implements was manifest in this department.

Our county being largely agricultural, and being so near Cincinnati, it cannot boast of extensive mechanical operations, but the articles that *are* made are generally of superior workmanship.

In no department, however, was there so full a representation as in Floral Hall. In this hall are exhibited fruits, flowers, paintings, useful and ornamental needlework, domestic or household manufactures, dairy products, etc. As usual, the ladies contributed a large share towards the attractions of the fair.

With the exception of apples, the display of fruits was larger, finer and more various than that of many previous years. The peach, the pear, and the grape, were perhaps, never before excelled in variety and quality, at our exhibitions. This county was peculiarly favored this year with a fine crop of these fruits. Some fine specimens of apples were shown, but they were rather exceptions to the general product of the county, for the apple, as a crop, may be called a failure this year.

Frequent reports of the condition and progress of the crops generally in this county during the past season having previously been given, it is deemed unnecessary to repeat them in this place. It may be remarked, however, that the increasing success in the cultivation of nearly all the kinds of fruits adapted to this latitude, is giving annually new inspirations, and an added zeal to the farmer, as well as the professional horticulturist, to enlarge this field of operations; and the experience of each year is proving that this county is destined to become prominent in the profitable culture of fruits for market.

Among the premiums offered at our last fair, was that of a banner to cost $40, to be awarded to the best drilled military company in the county, to exhibit on the last day of the fair. This was awarded to the "Lafayette Guards," Captain Watkins, of New Richmond.

The number of entries, and the number of premiums awarded in each class are as follows:

| | No. Entries | No. Premiums. | No. Diplomas. |
|---|---|---|---|
| Cattle | 28 | 20 | 8 |
| Horses | 106 | 51 | 3 |
| Ponies | 3 | | 2 |
| Jacks and Mules | 20 | 10 | 3 |
| Sheep | 7 | 6 | 3 |
| Swine | 11 | 10 | 2 |
| Poultry | 12 | 8 | |

Total number of entries, 884; total number of premiums, 405; total number of diplomas, 33; total amount awarded for premiums, $582 90. Number of members for 1861, seven hundred and sixty-nine.

## CLINTON COUNTY.

The annual exhibition of the Clinton County Agricultural Society, for the year 1861, was held on their Fair grounds, near Wilmington, on the 4th, 5th and 6th days of September. It was thought inexpedient by many to hold a Fair this year, fearing it would result in a failure, in consequence of the excited condition of the country in reference to the war. But the managers thought the interest of the society would be promoted by holding a Fair, even though it might result in a partial failure. But we are gratified to report that the exhibition, in all the departments, was very creditable, and the receipts sufficient to pay liberal premiums, and liquidate all indebtedness against the society, and leave a considerable balance in the treasury.

We have no statements of competitors for premiums on crops, or improvements in agriculture, to report. The principal crops raised in our county are wheat, corn, oats, and potatoes. We estimate the amount of wheat raised in our county, in the year 1861, at 390,000 bushels, and the average yield per acre 14 bushels; the amount of corn 1,500,000 bushels—average yield 70 bushels per acre; the amount of oats 200,000 bushels—average yield per acre 28 bushels; the amount of potatoes at 70,000 bushels—average yield per acre 90 bushels. In addition to the above-named crops, we raise quite a large quantity of rye, barley, buckwheat, and hay.

Our corn crop is not an average one, in consequence of the protracted cool weather during the forepart of the season, preventing its fully maturing before the fall frosts. Our wheat crop was very much injured by the weevil and fly, which are the most destructive insects to the wheat crop in our county. Our society is established on a firm basis, and is in a prosperous condition; and its beneficial influence in developing the resources of our county, and infusing a spirit of improvement in all branches of agriculture and horticulture, as well as all other branches of industry, is felt and acknowledged by all.

We have beautiful and capacious grounds, well improved, about half of which are covered with a natural grove of sugar and beech, which afford a delightful shade. There is a decided improvement in our exhibitions in the floral department, which is attributable to the industry and good taste of our ladies. Owing to the large increase of articles on exhibition in this department, the society contemplate building a new and more capacious Floral Hall the coming season.

Our society numbers 450 members.

## COLUMBIANA COUNTY.

In addition to the list of the premiums awarded at our last annual Fair, held on the Fair grounds on the 25th, 26th and 27th days of September, 1861, the Fair promised to exceed any one preceding it, judging from the attendance upon the first and second days. But the third day being ushered in with a flooding rain, which continued without intermission during the entire day, lost to the society a full half of what might have been realized with favorable weather. The entire number of entries was 956; of this number 267 were horses, 29 cattle, 69 sheep, 18 hogs, and 11 jacks and mules. Horses seeming to take the lead of all other stock in our county, were well represented, in both number and quality; whilst that of cattle, sheep and hogs, although few on exhibition, yet in point of quality, would compare favorably with any thing we have seen. The agricultural and mechanical departments were well represented, and Floral Hall, under the care of the ladies, was well supplied with articles both useful and ornamental. For a number of years complaints were urged on account of there being no suitable track attached to the Fair grounds, whereon to exhibit horses. And to provide for this seeming necessity, the Board of Managers, at an early day in the current year, added, by purchase, six additional acres to the original grounds, and contracted for lumber, &c, with the intention of making the required improvement; but our county becoming involved in her present difficulty about that time, the Board deemed it prudent to defer making any further expense during the present year. In addition to that here furnished, there were four other entries competing for premiums on crops, but the competitors failing to furnish the required statement, were ruled out.

The principal crops raised in our county are wheat, rye, barley, buckwheat, corn, and potatoes. Of wheat we raised about 200,000 bushels the last year; of rye 10,000, of barley 36,000, of buckwheat 2500, of corn 350,000, of oats 535,000, of potatoes 125,000. The average yield, per acre, of wheat about 12 bushels, of rye 15, of buckwheat 20, of corn 40, of oats 35, of potatoes 50. The season during the early part of the spring was wet, followed by severe frosts in May, which destroyed the greater part of the fruit in this county. Grass that seemed to be doing well previous to this, failed to meet the general expectation, being followed by a light crop. During harvest the Army worm made its appearance (for the first time we believe in this county), injuring the crops considerably. This was followed by an unusual amount of grasshoppers, which continued their depredations until late in the season, and in many places destroying the fall pasture, during the months of August and September, entirely. The present crops look unusually well, with more more than an average crop in the ground.

The following is about a fair average of selling price of farm products at the different markets in our county: Wheat 90 cents, corn 40. rye 40, oats 20, flaxseed $1.00, timothy $2.00, hay $8.00 per ton, pork $3 50 per cwt.

Our society numbers 362 members—a slight falling off from last year, produced, however, from the cause already stated. Many being prevented attending upon the third day, failed to make their annual payment, and are consequently not considered members. That our society is still advancing in its usefulness is evident to all. One of its principal features is the encouragement given to plowmen, the premiums awarded at our late Fair ranging from three to eight dollars, every year witnessing an improvement in this useful art.

## COSHOCTON COUNTY.

The twelfth Annual Fair of the Coshocton County Agricultural Society was held at the Fair grounds near Coshocton, on the 9th, 10th and 11th days of October, 1861, and was a success, notwithstanding the excitement in consequence of the war, the "hard times" caused by the great fall in the price of all our products, the total failure of our fruit crops, and partial failure of nearly all our other crops. The Board hesitated upon holding a Fair, fearing a failure; but when the time arrived, with beautiful weather, our fears of failure were soon dispelled, and we had the pleasure of greeting many more cheerful countenances than we had anticipated, the number of exhibiters and visitors in attendance and articles on exhibition being as large, with one exception, as any of our former Fairs, and every thing passed off highly satisfactory to all concerned, without accident or breach of any of our rules to mar the universal good feeling that prevailed throughout the entire exhibition.

The great objects of the Society are being realized by thus meeting and comparing notes, from year to year, as to results in our labors, by the introduction and rearing of the improved breeds of domestic stocks, the more thorough cultivation of the soil, the introduction of improved implements of husbandry, and the different varieties of roots, grain, grapes, and fruit. We are better prepared to meet the wants, wishes and feelings of all, and inspire confidence in our ability to secure greater results from our future labors.

The show of Cattle, although not as large as last year, was fine, and the competition spirited. The appearance every year of new contributors to this department, shows that the improvement of this kind of stock is becoming a matter of more general interest. The splendid thoroughbred shorthorn Durham herds of Messrs. Thos. Darling, T. S. Humrickhouse, and S. Miller, are hard to beat. Messrs. R. Darling, D. Markly, T. C. Burrell and others, exhibited some superior stock in this class. No. of entries, 62. Premiums awarded, 33—amounting to $116 50.

The show of Horses was equal in quality to that of any previous exhibition. No new strains of stock have been introduced during the year. Entries, 86. Premiums, 41; amount, $93.

Of Jacks, Jennets and Mules, the exhibition was better than at any former Fair. This branch of stock is receiving much more attention than formerly. Entries, 7. Premiums, 5; amount, $12.

Of Sheep, opinions are various as to the preferable breeds, the Merinos perhaps being thought best by the majority, but the Longwool and Mutton breeds are fast gaining favor with many of our wool growers. Some very superior Southdowns and Cotswolds have been introduced within the past year. The number on exhibition was not as large as it should have been, but would successfully compete in quality with any like number of pens from any other county in the State. A large proportion of this county is well adapted to sheep raising. Entries, 29. Premiums, 18; amount, $51.

The show of Hogs was not large, but considerable improvement was noticed. Chesters are rising in public estimation. The shipment of hogs from this county this season will greatly exceed that of last year, and is the only full crop the county produced this season. Entries, 12. Premiums, 6; amount, $21.

The show of Poultry was small, but large quantities are being shipped to eastern markets the present season. Entries, 8 Premiums, 5; amount, $4 50.

The Dairy receives but little attention in this county, and but few samples of products were on exhibition. Entries, 3. Premiums, 2; amount, $4.

Fruit was a total failure, having been destroyed by late spring frosts.

The exhibition of improved farm implements and machinery was large, though but a small portion was manufactured in the county. There is an increasing demand amongst our farmers for articles in this line, and inventors and manufacturers of meritorious articles would find it to their advantage to exhibit in this county more freely.

The Halls were all well filled. The ladies of our town and county deserve great credit for their energy in getting up their fine butter, cheese, preserves, jellies, jams, pickles, sealed fruits of different kinds, quilts, coverlets, carpets, door mats, rugs, different varieties of embroidery, and a great many of the discretionary class of articles, all of which went to fill up the Halls and add to their beauty.

The Mechanics' department was well represented by our cabinet makers, saddlers, tanners, wagon and carriage makers, all of whom had good specimens of their work on exhibition.

Our Society was never in a better condition for usefulness than it now is, and we hope to be able in each succeeding report to note a continued progress, for notwithstanding the advance already made, there is yet a wide margin for improvement.

There were no entries for field crops of any kind; the unfavorable season and consequent partial failure of all our principal crops was probably the cause.

The principal crops raised in this county are corn and wheat. It is difficult to fix an average upon crops upon our lands, as we have every variety of soil, from the rich alluvial bottoms to the most steep and sterile hills; some capable of producing 100 bushels of corn and 40 bushels of wheat per acre, and others not one-fourth that amount.

Rye, barley, oats and buckwheat are cultivated to some extent, and pay well in some portions of this county. There is an unusually large breadth of land now seeded in wheat, and looks well.

Considerable attention is being paid to the cultivation of Chinese sugar-cane, and is fast gaining favor with our farmers.

Our Society, as well as many of the industrial interests of the county, have suffered a great loss in the death of two of our most valuable members, and for many years efficient officers, William K. Johnson and Arnold Medberry, both of whom have been called to receive the reward of their well spent lives, within the past year. May their virtues be emulated by the present and future generations.

## CRAWFORD COUNTY.

In accordance with the requirements of the statute passed 20th February, 1861, I herewith submit a report of the affairs of the Crawford County Agricultural Society, and of the condition of the agricultural interests in this county.

For a long time the Board of Directors were doubtful of the propriety of holding any Fair at all, and the question was not finally determined until May, when, in view of the fact that the officers and managers had not been elected to suspend the Fair, but to conduct it, it was resolved to hold a Fair as usual.

The matter having been in doubt for many weeks, and the unsettled state of the country together, combined to make the Fair quite below the average in many respects, but in the articles of horses and sheep, the collection was very superior.

The earliness of the Fair, also—18th, 19th, and 20th September—caused the fruit, grain and root crop departments to be quite poorly represented. The Fair was nevertheless profitable, and more than paid its expenses, with the aid of the State fund.

In this connection, I present a tabular statement of the number of papers, books, &c., and of the amount of cash offered as premiums; of the number of papers, books, &c., and the amount of cash awarded; and of the number of books, papers, &c., and of cash drawn by those who took premiums; the sums affixed to the periodicals being the amounts paid in cash to those who preferred cash to periodicals or books:

| | Premiums offered. | Prem's awarded. | Taken. |
|---|---|---|---|
| Cash | $635 25 | $270 50 | $345 00 |
| Ohio Farmer, $1 | 141 | 70 | 35 |
| Ohio Cultivator, 40c | 134 | 41 | 14 |
| House and Garden, 20c | 17 | 4 | 4 |
| American Agriculturist, 75c | 13 | 5 | 2 |
| Field Notes, $1 | 1 | 1 | * 2 |
| Books valued at $1, 50c | 7 | 5 | 5 |
| Klippart's Wheat Plant, $1 | 4 | 3 | 1 |

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* One being exchanged for an Ohio Farmer.

I would here observe that we require all premiums to be called for within sixty days, or they become forfeit; and in addition to the above exhibit, there remain two Ohio Farmers and one Ohio Cultivator, and $2 cash, not yet called for.

The Society has labored under great difficulties from a want of proper grounds, and suitable accommodations in them. While the condition and position of our fair grounds is excellent, they are too small; the constant repairing necessary to temporary stalls and buildings, is a severe annual tax, and we believe community are awaking to the importance of having permanent grounds. For this purpose the organization of a joint stock company, formed by the subscription of 160 shares, at $25 00 per share, for the purpose of purchasing permanent fair grounds and fitting them up substantially, is being agitated, and a preliminary meeting has been held upon the subject, and a report of the proceedings had at said meeting is hereto affixed. The prospects of the progress and usefulness of our Agricultural Society, will depend mainly upon the success or failure of the movement now in progress. Should this scheme succeed, our prospects will be very flattering indeed, and our fair will undoubtedly, with energetic management, become one of the prominent institutions in this section of the State; should this movement fail, we shall probably be doomed to early dissolution, for the want of suitable grounds, in which to expand and thrive.

The following are the proceedings of a meeting held at Bucyrus, for the purpose of taking measures to permanently establish a County Agricultural Society:

The meeting organized by calling Gen. S. Myers, to the chair, and appointing J. Hopley, as Secretary.

After a mutual interchange of views between many of the gentlemen present, the following resolutions were passed:

*Resolved*, That we endeavor to establish our County Agricultural Society, upon a permanent basis, by forming a Joint Stock Company, for the purchase of grounds, to be fitted up for fair grounds.

2. That this company be formed by the subscription of 160 shares, at $25 00 per share.

3. That such shareholders shall be entitled to have one vote in controlling the affairs of the company, for every $25 00 of stock subscribed.

4. That no shares shall be payable until $4,000 have been subscribed, and that before collecting any subscriptions, the officers of the Agricultural Society shall determine that there have been $4,000 of reliable subscriptions made.

5. That no payment of stock shall be required without two months notice, and that no more than two-fifths of the stock subscribed shall be called for at any one installment.

6. That when the whole $4,000 shall have been subscribed, a meeting of the stockholders shall be called to select a committee, consisting of stockholders, no two of whom shall reside in the same township, to report suitable sites for fair grounds; and the terms upon which the same can be obtained.

7. That the same meeting, shall permanently organize, by the appointment of such officers, as they may deem requisite, and that a committee of shareholders,

be also appointed, at said meeting, to draft a constitution and by-laws, for the regulation of the company.

8. That the Secretary be requested to prepare suitable blanks for the taking of subscriptions, and to furnish copies to each member of the board of directors of the Agricultural Society; and that these gentlemen be requested to obtain subscriptions upon the foregoing terms

9. That said board of directors be further authorized to obtain the assistance of any other gentlemen who may be interested in this movement.

10. That a copy of these proceedings be furnished to every newspaper in the county for publication.

S. MYERS, *President.*

J. Hopley, *Secretary.*

The principal crops raised in this county are, wheat, corn, oats, clover-seed and hay. Estimates of the amount of each, and of the average yield per acre, are not within our reach at this time. The weevil and the Hessian fly injured the wheat to a slight extent. Upon the whole, the season for agriculture was highly favorable, and our farmers have been blessed with abundant crops.

Very much wool and many beeves, are annually exported from this county. Our stock of sheep are very superior, and great enterprise has been manifested by our farmers in the improvement of their flocks. Beeves, also are much improved, while great progress is being made in the same direction in our hogs.

The farmers of this county are rapidly advancing in improved modes of agriculture, and liberally invest in improved agricultural implements of all kinds; and, although, there is very much marsh land in portions of our county, yet very much draining has also been done.

Upon the whole, our farming community, are by no means insensible to the advantages of progress, but are making rapid strides towards a highly improved condition of affairs.

## CUYAHOGA COUNTY.

The fifteenth annual fair of this Society, was held in the city of Cleveland, October 1st, 2d, 3d and 4th, 1861, and although the exhibition was not as full in every department as on some previous years, it was good in most, and in some it excelled.

Our fair grounds having been used the past summer as a camp ground, for "Camp Taylor," it was so late before we could get possession of them, that some thought it advisable to dispense with holding a fair, but notwithstanding all drawbacks, we were able to pay all expenses and premiums, and some little of our debt left over from last year.

The board this year dispensed with family tickets, which tended greatly to increase our receipts, and prevented much imposition.

The fruit crop in this section of the State, with the exception of grapes and apples, was a failure. The apple crop was very light, but the crop of grapes was never as large, nor the fruit of as fine quality. A large quantity found a market in New York, Boston and Washington, and brought remunerative prices.

The vegetables were as usual of superior quality. In this department Cuyahoga county, cannot be excelled in the State.

The show of horses, cattle, sheep and swine was good, and as large as at any previous fair.

We were favored with fine weather, and the fair of 1861, passed off very pleasantly.

## DARKE COUNTY.

The ninth annual fair of this Society was held at Greenville, commencing October 2d, and continued four days. The attendance during the fair was good.

There were several entries on crops, but there were none which complied with the premium list, so there were no premiums awarded.

The condition of agriculture in this county, is improving. During the existence of our Society, progress has been made in many respects; in a more careful tillage, in the saving and application of manures, in a more systematic rotation, in the introduction of labor-saving machines, and in a pretty general practice of, and judicious system of draining and reclaiming wet and swampy lands, which proves to be as good, if not the best land we have, and especially in the improvement of all kinds of live stock it has been very decided. And we cannot doubt that the rivalry and emulation incited by our annual exhibitions has in this connection had influence for good.

This fair, considering the unsettled state of the country, has been a decided success. Our membership is 530, not quite so large as last year, owing partly to the unsettled condition of the country, and partly to other causes, but still the membership is respectable, and the attendance during the whole fair was good. And what was better than all, good feeling prevailed generally; all persons seemed to enjoy themselves and were much interested in the exhibition.

The entries of horses were as large as any previous year, and of good quality.

The show of cattle was not as large as last year from some cause, although there has been a marked improvement in the cattle of our county since the organization of our Society. The show of cattle, nevertheless, was a fair one, and of good stock.

HOGS.—In no department of stock, since the organization of our Society, has the improvement been greater than in hogs. The show of hogs at our last fair was decidedly better than on previous occasions, and is thought by judges and men who had been at the State Fair, to equal, if not surpass any exhibited at the last State Fair.

Sheep.—We had quite a number on exhibition of good grades. Our county is tolerably well adapted to the raising of sheep, but owing in a great measure to the depredations of dogs, there are not many raised.

Quite a number of labor-saving machines, such as reapers and mowers, hay-rakes and threshing machines, were on exhibition, which show that improvement is steadily progressing. Plows of improved patterns are constantly coming. But Franklin's motto still holds good, that is—

> "He who would by the plow thrive,
> Himself must either hold or drive."

Floral Hall and Household Manufactures.—This department was well filled with carpets, blankets, quilts, and all manner of household manufactures and tidies of the finest styles and patterns. The hall was beautifully decorated by the ladies of Greenville and vicinity, which speaks favorably of their taste and energy.

The principal agricultural products of Darke county are, wheat, corn, oats, barley, rye, potatoes, flax-seed and clover-seed, and lately, to some extent, Sorghum or Chinese sugar cane.

Wheat.—Our usual average is from 15 to 18 bushels per acre. The crop this year was fair, but the yield was not so large as last year.

Rye is not very extensively raised; crop this year about an average.

Corn.—Our usual average is from 35 to 40 bushels per acre. The crop this year is a very good one, above an average, and of a very good quality.

Oats—Usually about 30 to 35 bushels per acre. The yield this year is fair.

Potatoes.—Generally good.

Fruit.—The samples on exhibition were fine, but the crop this year was almost a failure.

Sorgho or Chinese sugar cane, is raised considerably this year, and there will be more next. Quite a number of farmers raised this year one, two and three barrels of molasses, and that of best quality, being nearly or quite equal to the golden syrup.

There has been nothing very remarkable in the past season, more than it has been a favorable one for the securing of bountiful crops. We have been visited by the army worm in different parts of the county, but it was not general. The crops most injured by them were corn, barley, meadow and pasture; their stay, however, was of short duration.

## DELAWARE COUNTY.

Our farmers, as a general thing, take a great interest in our annual meetings; in fact, our farmers are the chief and almost only supporters of the society, and take unbounded interest and pride in supporting and maintaining the interest and advancement of the society. Our stock, if not so numerous, was equal, if not superior in quality, to any other previous year.

The principal crops raised in our county are corn, wheat, oats, and flax seed. The corn crop was very uneven over the county, owing to the effects of the drouth. The bottom land produced a fair crop, in some cases amounting to ninety bushels per acre; while the upland produced an inferior crop to any that has been produced for many years.

Wheat gave an average crop, in some places good, and of an excellent quality.

There was but little barley raised; the farmers preferring that which ennobles to that which makes the brute.

Oats gave a fair yield, and of a good quality: fifty bushels to an acre is not an uncommon crop—thirty to forty is an average crop.

Flax seed was poor, owing to the excessive drouth. There is a rope manufactory in Delaware, which proves of some value to flax growers, paying some four dollars per ton for the flax straw.

The farming implements in the county are generally good. Reapers and mowers have, within the last few years, become common utensils among our farmers.

There is scarcely any fruit at all in the county, having been destroyed by the late frost in the spring. In favorable seasons our county raises some of the finest fruits. Grapes and apples grew in abundance; and more than this, I am pleased to state that our farmers are taking an increased interest in the cultivation and improvement of fruits, especilly apples and grapes, and have planted large orchards, which flourish well upon our well-adapted soil, while almost every cottage is concealed with grape vines.

The Fair was held on the 17th, 18th, 19th and 20th of September, 1861. The weather was warm and pleasant, and the people turned out marvelously well to see what was to be seen, and learn what was to be learned, not forgetting the main and true object of the society, the cultivation of the moral, intellectual and social qualities of all classes and persons.

## FAIRFIELD COUNTY.

The tenth annual Fair of the Fairfield County Agricultural Society was held upon their Fair grounds on the 9th, 10th and 11th of October, 1861.

Notwithstanding fears were entertained by many that, on account of the distracted condition of our country, our Fair might result in a failure, yet we have the satisfaction to report you that the society has met with a success far surpassing our best anticipations.

Whilst the number of our entries fell far short of the number for the preceding year, yet, taking into consideration the entire failure of the fruit crop in this section of Ohio, the number is quite as large as any year preceding.

The cattle show, comparatively, was very meagre, whilst the horse show was the best we ever exhibited; for fine blood, style, for beauty, action, as well as draft, the horse show far surpassed any of our similar exhibitions.

The average of our wheat crop was small, but the quality good. Average of corn crop about forty bushels to the acre, and quality good. Hay crop good; potatoes and oats good.

## FAYETTE COUNTY.

The Fayette County Agricultural Society respectfully represents, in pursuance of the statute and the printed requirements of the State Board, as follows:

The entire amount of premiums awarded at the last annual Fair, held at Washington, on the 4th, 5th and 6th days of September, was $635.

There were no competitors this year for farms, farm crops, or improvement in tillage.

The number of the members at the last annual election was 37. Many of the old members were wisely retained in the Board. The premium list was arranged as the Board thought in a manner best suited to the community, and, considering the state of the country, the Fair was a decided success.

The society, for some cause, had become considerably embarrassed, but the present Board have about cleared it of debt, and its prospects for success and usefulness, with proper management, are very flattering.

The principal crops raised in the county are corn, wheat, oats, rye, buckwheat, potatoes, fruits and grasses, but to give an estimate of the amount of each cannot, from any of our statistics, be done with sufficient certainty to render it of any value.

The previous year has been remarkably seasonable for all the principal crops adapted to this county, fruit excepted.

The weevil have done some harm to the wheat, but, with this exception, no crops have suffered materially from insects.

The Fair grounds are in good order, and required no material improvement to render them suitable for the last Fair.

## FRANKLIN COUNTY.

In compliance with the laws of Ohio for the encouragement of agriculture, and the rules of your Board for the organization and management of County and District Societies, we herewith present you with the annual report of the Franklin County Agricultural Society, so far as we are able to comply with the said rules.

The past year was almost anything but favorable for the operations of our society, the state of the country, the financial condition of our treasury, the early season at which our annual Fair was held, and the unfavorable prospect of the fruit and vegetable crops, all tending to dishearten us, and creating a fear that we should involve ourselves in debt, and meet with poor success.

The report of the late treasurer had been read at a meeting of the old Board, held some time previous to the annual meeting, and his books were examined by a committee and found to be correct, and that there was a balance remaining in his hands of $804.98, which he confessed his utter inability to pay. This amount would have aided the society in making various improvements on the Fair grounds, and would also have enabled them to relieve themselves entirely from debt. But the funds have never been paid, and probably never will be. The by-laws of our society requires the treasurer to execute a bond in the sum of $2,000 for the faithful performance of his duties, etc.; but, owing to the ignorance or neglect of several previous Boards, no bond had ever been given. The gentleman who has thus placed our society in an almost bankrupt condition held the office of treasurer for some ten years, and had, during that time, the entire control of the finances of the society.

With this state of the treasury—entirely empty—the new Board were disheartened; but, after consultation, it was determined to hold a Fair, and to borrow money for the purpose of making some needful improvements on the Fair grounds.

The time for the annual Fair was fixed on the 3d, 4th, 5th and 6th days of September. The improvements made on the Fair grounds prior to the holding of the Fair, consisted principally of the erection of additional cattle and horse stalls, the extension of a sewer (covering a run which crosses the grounds), entirely through the grounds, and the enlargement of the ring for the trial of the speed of horses—all valuable improvements, involving an outlay of several hundred dollars, a portion of which was subscribed by citizens of the county.

The list of premiums offered was very large, embracing a great variety, and amouted to over $1,000, payable in cash.

The Fair was held on the days appointed, and, though the exhibition was not in itself a success, yet the attendance upon it was very large, evincing the deep interest the citizens of the county take in the success of the society. The whole number of entries made was 971, a falling off of near 300 from the previous Fair. The principal entries were in stock, there being a larger show in that line than at any former Fair. The weather during the four days of the Fair was very pleasant, although, in consequence of no rain falling, the dust was almost intolerable in the transit to and from the Fair grounds, which was partly *settled* by the use of the sprinkling wagons.

| | |
|---|---|
| The total receipts of the Fair, from all sources, was................ | $2,114 71 |
| The expenditures, including the payment of borrowed money, were.. | 2,186 34 |
| Leaving a deficit of.......................................... | $71 63 |

Which amount has been anticipated by the Board in the amount due from the county. A list of the premiums awarded are attached hereto. The entire indebtedness of the society now is about $342, being balance due on 2¼ acres of land purchased as an addition to the Fair grounds some three years ago.

The whole number of members of the society is 1100. The grounds and fixtures of the society are worth at least $10,000.

Although the financial condition of the society looks rather gloomy, yet we believe there is a glorious future in store for it, and that eventually we shall be free from debt, with as fine a Fair grounds, with permanent fixtures thereon, as may be found in the State. We might have been relieved from all debt whatever, and been high and dry above the financial storm which some think is now threatening our once happy and prosperous county, had our late treasurer been able to pay over the balance of the society's funds in his possession.

The principal crops raised in this county are wheat, corn, oats and potatoes. The raising of stock is also carried on to a very great extent. The peculiar characteristics of the past season were the falling of a great deal of rain during some portions of the season, while at other times dry weather was the complaint of our farmers. The fruit crop in this county was quite meagre, the peach and apple crop being an entire failure. Berries of all kinds were plenty. We cannot give an estimate of the amount of crops raised, nor the average yield per acre.

## FULTON COUNTY.

The Fulton County Agricultural Society would respectfully submit the following report, in conformity with the rules of the State Board of Agriculture:

Our Society is in a prosperous condition. Our Fourth Annual Fair, which was held at the Society's grounds, near Ottokee, on the 18th, 19th and 20th of September last (1861), was by far the best that the Society has ever held. The weather was fine, although very hot, and the grounds of the Society, which contain about eight acres, were filled to overflowing; in fact, the crowd was so dense that it was uncomfortable; nevertheless, every one kept their temper, and the utmost good feeling prevailed.

The show was very fine in almost every department. The show of horses was very large; and if our county does not contain as good horses as any in the State, there is none that can exceed our citizens in the spirit of competition, as the list of entries will show. In Class A (blooded horses) the entries went up to nearly forty, and in Class B (horses for all work) they went up to nearly one hundred and fifty. The show of cattle was large, both blooded stock and grades. The stock of sheep and hogs was not large, but very fine, while agricultural implements and mechanical labor were well represented; but the chief attraction during the fair was the Ladies' Department, or Floral Hall, as it was denominated. On entering it, the spectator was perfectly bewildered with beauty; every thing that was rich, rare, and lovely, met the eye, and arranged with the most elegant taste.

Flowers, both natural and artificial; paintings the most gay and elegant; shell-work, bead-work, and embroidery, that puzzled the brain of the sterner sex to imagine how it was ever wrought by human hands; quilts, counterpanes, and table-spreads—a countless variety.

But it was found upon examination of the dairy products that female hands were good for something besides embroidery and painting; for that the preserves, marmalades, and jellies were appreciated, was fully demonstrated by the liberal way in which the committees and others tested their good qualities.

The show of fruit was not as good as some previous years. The trees have been badly injured by the span-worm for the last two years. Peaches were almost an entire failure—winter killed. The grape crop is becoming quite an item in our county; the show was very respectable, and the quality good.

The vegetable department could not be surpassed by any county in the State. We have just the soil for vegetable culture. A deep, sandy soil, naturally rich, and which can be stimulated with manures without any danger of injury to the crop, and very easy of cultivation, more so than any clay soil can be, makes it one of the best in the State.

The sugar-cane or sorghum crop has been quite an item this season, and has amply repaid the cultivation. Some have realized at the rate of 300 gallons of good syrup per acre.

The wheat crop the present year was more than an average crop, and the quality never better; but the wheat now sown is injured by the fly, especially early sown white wheat.

The corn crop was first-rate, and so abundant that it is worth almost nothing, selling at from ten to fifteen cents per bushel in baskets.

It would be very difficult to give any thing like a correct statement of the amount of the several crops raised in our county, or the average yield per acre; in fact, it would not be much better than a guess, and therefore we refrain from any statement on the subject.

But we had almost forgotten to say any thing concerning the riding and driving, which, in fact, was one of the chief attractions of the fair. The list of competitors was quite large, and the scene animated. The ring was filled with pretty women on fine horses, each eagerly contending for the prize, which elicited loud and prolonged cheers from the crowd of spectators.

We had one scene, at the suggestion of our President, that was entirely new, at least so far as we are acquainted. After the riding and driving was over, all the stock on exhibition was taken into the ring (the poultry excepted), and driven round two or three times, and it formed a fine spectacle—indeed, quite a caravan—and could all be seen at one view.

The number of members of our Society the present year is 169, and the number of entry tickets sold during the last two days of the fair was 1,301. We would further say that our Society is considered one of the permanent institutions of the county, and its effects are visible on all kinds of stock and every branch of industrial labor.

## GALLIA COUNTY.

Our Society has neither Secretary nor Treasurer (both gone to the army), and the Treasurer's account had to be gathered from his books.

The Treasurer's books show the amount of funds on hand to be $105.50.

The Society thought it expedient not to hold any Fair for 1861, on account of the unsettled state of the country, and our peculiar situation; being on the border, and so much excitement, the Board thought it best to pass over this year, and be better prepared for the next year.

## GEAUGA COUNTY.

The Geauga County Agricultural Society is one of the earliest formed in the State, and continues to maintain a good degree of efficiency, and to accomplish, with reasonable success, the objects for which it was instituted. Three years since, a large indebtedness was incurred by the Society in enlarging and fitting up the grounds, which, in the present condition of the country, and consequent financial embarrassment, makes a burden difficult to remove.

The Annual Fair of the Society for the year 1861, although in many departments the exhibition was fully sustained, was not as largely attended as has been usual for a few years past; consequently the receipts were not as large, realizing very little more than to pay the current expenses for the year. Nor does the Society show as large a number of members as usual. This may be better understood by stating that from the time of the organization of the Society the annual tax upon members had been fixed at fifty cents. Under instructions from the Secretary of the State Board, this tax was raised to one dollar per member. This change, coming at a time when the pressure of the want of money was most seriously felt by the people of the county, undoubtedly made a difference in our receipts from members, while none are recognized as such except those who regularly pay their tax.

On the whole, the condition of the Society is such as to warrant the remark, that when rebellion shall be crushed out, and peace, quiet, and prosperity restored to the country, the old pioneer society will be pursuing the even tenor of its way, and accomplishing the objects of its organization.

## GREENE COUNTY.

The Annual Fair of the Greene County Agricultural Society was held on the Society's grounds at Xenia, October 9th, 10th, and 11th, 1861, and, notwithstanding the universal gloom which prevails throughout our country, our Fair was at least as successful as any previous one held in the county. Horses, as usual, formed a prominent feature; and, as an appreciation of the standard of our county in this particular, eight counties were represented to contest for the premiums in the various classes. This department of our Fair, although good in the past, has this year eclipsed all former exhibitions held in the county. Cattle, the number of entries not large, but the exhibition was of a first-class character. Mules and asses very good, and show considerable increase in numbers. Sheep not largely represented, but generally good. Hogs were out *en masse*, showing a marked improvement over former years; a better exhibition is rarely to be seen anywhere. The other departments of our Fair were not so fully represented as they should have been, although the articles exhibited were in a high degree creditable, and displayed fine taste and skill in their production.

The season has been a favorable one for the farmer. Meadows and pastures very fine, and the yield much above an average. Corn crop very good, but the extremely low price realized has made the crop a tax rather than a source of revenue to the county. Wheat much below an average, generally caused by the ravages of the fly, although there have been many fields injured by the weevil. Oats good, but not extensively cultivated. Barley about an average crop. Potatoes are becoming more generally cultivated, and for four or five years past have been much more profitable than wheat or corn. The cultivation of sorghum is beginning to attract the attention of our farmers, and will no doubt in future be much more extensively cultivated, the experiments so far made going to show that the net proceeds are quite remunerative, and will enable us in the future to be less dependent upon that portion of our country which has heretofore furnished us with the productions of the sugar-cane.

We have no important improvements to report either in agriculture or mechanism. The good results of our Agricultural Society have been too long and well tested to admit of a doubt as to the propriety of its existence in the future.

## GUERNSEY COUNTY.

The Fourteenth Annual Fair of the Guernsey County Agricultural Society was held on the Fair grounds, at Cambridge, on the 10th and 11th of October, 1861. The first day was tolerably fair weather, but the second was very rainy. The display of stock was small, but embraced some very good animals. The exhibition of fruits, vegetables, and farm products did not compare with former years. Altogether the Fair was a failure. The causes that produced this result are as follows: The engrossment of the public mind with the country's troubles, nothing being thought of but the Rebellion and the war; the drought of the summer, cutting short the grain and vegetable crops; the frosts of spring, destroying apples, peaches, plums, &c.; the scarcity of money, or rather a disposition to economise in expenditures; and last, the miserable weather we had at the Fair, rendered the attendance quite limited, and the receipts correspondingly small.

There are no "statements of competitors for premiums on crops and other improvements in agriculture" to report.

For causes already alluded to, the officers of the society did not hold as many meetings, or manifest as much interest in its affairs the past season as in other years. The number of members was about 150. The society has been of benefit to the agricultural interests of this county, and there is no doubt that, after the war is over, an increased zeal and enterprise will be exhibited by our farmers in the promotion of its usefulness.

This county, as you are aware, is mostly a "hill country," intersected by numerous creeks, along which are found strips of bottom land ranging from a few hundred yards to a mile or two in width. These bottom lands produce fine corn and grass. Much of our hill land is finely adapted to wheat, corn and oats, our principal grain crops. What amount of each of these grains was raised the past season we cannot give. They were all short crops. Of wheat and corn, the following averages per acre are large: Wheat 10 bushels, corn 20 bushels—the weevil damaging the former, and dry weather and the grub-worm injuring the latter. Our grass crop was light, caused by the dry season, and, in some localities, the grub-worm. Potatoes produced pretty well, and of good quality. Apples and peaches were almost an entire failure. There was a very small crop of cherries and plums. The small fruits—grapes, currants, raspberries, gooseberries, strawberries and blackberries—did well. Grapes were especially good. The production of Sorghum was not large, but the canes grew well.

## HANCOCK COUNTY.

The Tenth Annual Exhibition of the Hancock County Agricultural Society was held on their grounds, at Findlay, on the 26th, 27th and 28th days of September, and had the Board been gifted with "foreknowledge," they could not have selected a more unfavorable time for their Fair. A combination of unfavorable circumstances rendered the Fair almost a complete failure, both pecuniarily and in point of interest. The weather was very unfavorable, being cold, with rain on the first and second days.

The society were fortunate enough, however, to receive just about funds enough to pay off their indebtedness. There were 512 entries, in all classes. We have now 300 members. There were premiums to the amount of $316.00. The number of entries, and amounts paid on premiums, is very much less than last year.

The Secretary has received from the Agricultural Department of the Patent-Office, at Washington, 15 copies of the Agricultural Report for 1860, 13 sacks of wheat, and 2 packages of garden and flower seeds; all of which have been distributed.

## HARDIN COUNTY.

The Eleventh Annual Fair of the Hardin County Agricultural Society was held at Kenton, on the 2d, 3d and 4th days of October. Although farmers were not entirely done cutting up corn, there was a large attendance, and rather more than the usual interest taken, notwithstanding the minds of our people were largely occupied in the unhappy condition of our country, which taxes all its energy and resources to put down the Southern rebellion and enforce the laws. Nearly every department that premiums were offered, were pretty well represented, so that a fair competition prevailed. The exhibition of horses, cattle and sheep, were good; though the latter ought, and perhaps will ere long, be much improved. The hogs excelled anything of the animal kind on exhibition, and gave evidence that great care and attention had been taken to their improvement. The Poland and big China, lately imported from Butler county, attracted most attention, and took first premiums; though there were others that showed a decided improvement on former years. There was a good exhibition of farm products, which showed that no little pains had been taken in their improvement. There were no competitors for premiums on best tilled crops of any kind; but the samples of wheat, corn and potatoes were very good, which, together with hay, are the principal crops produced in the county. There is no county in the State susceptible of producing more grass or wheat per acre than ours. There has been as high as 45 bushels of wheat produced to the acre, and three tons of hay; though it would not perhaps be proper to put the average yield of wheat, the county over, at more than 17 to 20 bushels, owing to imperfect tillage.

There has been no injury done to crops in the county the past season, in consequence of any destructive insects. The summer being a dry one, the corn crop was hardly an average one, and will not exceed 35 bushels per acre, though farmers perhaps might have realized a larger yield if they had paid more attention to their seed, which is of too small a kind to produce a heavy yield per acre. Many are afraid that the seasons are not long enough to mature a larger kind, which we think is not so, if care is taken in the selection of varieties. Owing to the fact that our county is comparatively a new one, less interest is taken by its inhabitants in fairs than is manifested in the older ones; but it is being gradually filled up with a more enterprising and scientific class of farmers, the result of which will be manifested at our subsequent fairs. The Society being out of debt, the future looks more encouraging. With an addition to the grounds and buildings, it may be put down as one of the permanent institutions of the county.

## HARRISON COUNTY.

The Fourteenth Annual Fair of the Harrison County Agricultural Society was held on the Fair Grounds, at Cadiz, on the 2d, 3d and 4th days of October, 1861. The weather was fine, and the attendance much larger than at any former fair, and the Society is in a better condition financially than formerly.

The principal crops raised in this county are wheat, corn, oats, potatoes and hay.

**Wheat.**—More than an average—say 18 bushels per acre.

**Corn.**—Yield less than average, owing to dry weather—about 40 bushels per acre.

**Oats.**—Good, both in quantity and quality, with light straw; average per acre, 40 bushels.

**Potatoes.**—Tolerable yield, but are rotting badly. Average not more than 150 bushels per acre.

**Hay.**—Less than average.

**Fruit.**—Except berries, have proved almost a total failure.

## HIGHLAND COUNTY.

The attendance at the Fair this year was much less than that of several years previous, owing, no doubt, to the depressing influence of the state of affairs of our country. Still the exhibition realized the anticipations of its warmest friends—well aware, that had circumstances been favorable, many would have been in attendance, that force of circumstances compelled their absence.

The Society has been steadily progressing in the number of its members and in the condition of its finances since its formation; and the effects of the establishment of the association is quite perceptible throughout the county. Contrasting the present condition of agriculture with that of its condition in the early history of its organization, it is a source of congratulation, even should its operations now receive a temporary check.

The exhibitions in some of the departments were worthy of those of former years.

**Horses.**—In this class there was about the usual number on exhibition—evincing in their style and qualities the care taken in proper breeding. The recent introduction into our county of several thoroughbred stallions, gives evidence of the improvement to be made in our hitherto good stock of horses.

**Cattle.**—A limited number on exhibition, but of the usual good quality. Though the price of cattle has been low for some time past in this region, the important subject of proper breeding has not been neglected. There were several very fine specimens of fat cattle on exhibition.

**Swine.**—There were some very fine specimens to be seen—the unusually good corn crop last year contributed to this end. Our crop is very heavy this year and of unusual weight. Our breeds consist in Chester White, Poland, Leicester, and their crosses. Pork sells here for from $2 75 to $3 10 per cwt.

**Mules.**—A decided improvement in this branch of stock.

**Sheep** —There is comparatively little attention paid to this kind of stock.

**Wheat.**—Our wheat crop has suffered materially from the ravages of the weevil, in a large portion of the county, thus reducing the crop to about one-half of the usual average, and of inferior quality. Those having sown the "Lambert Weevil Proof Wheat," escaped the destructive effects of this insect. Wheat is now selling here at from 70 cents to 85 cents.

**Corn.**—The corn crop is about an average in yield, and of inferior quality. Sells at 25 cents per bushel.

**Oats.**—There is but very little grown. Sells at 20 cents per bushel.

**Fruits.**—Of peaches there was below an average crop. Apples, scarce and not well developed.

There has been an average yield of root crops, the potatoes slightly affected with the rot. Potatoes sell at 40 cents per bushel.

The number of members for the past year is 500.

As to the financial condition of the Society, owing to the extended improvements, and the unexpected lack of patronage last year, will leave the Society somewhat embarrassed, but with the subscription to be collected, we hope soon to be out of debt, and owning one of the most elgible fair grounds in the State.

## HOCKING COUNTY.

The Ninth Annual Fair of this Society was held at Logan, on the 2d, 3d and 4th days of October, 1861.

The attendance of visitors, from this and adjoining counties, was not as large as on former occasions, owing in a great degree to the disturbed and unsettled condition of the country; the diminished interest in agricultural affairs, in consequence of the large number of persons, formerly engaged in that pursuit, who are now in the army, together with other causes resulting therefrom—all of which have necessarily had an unfavorable result to the agricultural interests in our county.

The whole number of entries made this year was 460, being 136 less than those of the previous year.

The quality of stock on exhibition was generally about equal to former exhibitions; and no material improvement was apparent, except in sheep, of which some fine specimens were entered, and we are encouraged to anticipate a still further improvement in that as well as all other classes of stock.

The display of manufactured articles was not so large as was expected, although in quality nearly if not quite equal to the previous year.

In agricultural implements we have no considerable advancement to report, our farmers as a general thing have not taken the interest in the most improved implements that might be desired.

In field crops we have to report that, while most grains produced an average yield, the wheat crop was below the usual average yield; having been considerably injured by weevil and other causes; but our farmers are endeavoring, as much as possible, to procure the so-called "Weevil Proof Wheat," for the future, much of which has already been introduced in this county, and as a general thing has given satisfaction. The yield per acre not being quite so much as other species of wheat, but the crop is much more certain than other qualities, by reason of its not being so susceptible of injury by various insects, which have injured other kinds of wheat very materially for several years past.

The principal agricultural products of this county are wheat, corn, oats, rye, &c.

Taking into consideration the many disadvantages with which our Society had to contend during the past year, for obvious causes, we are of the opinion that the general prosperity of the Society and the interest manifested therein, are as good as could be expected, when we consider the fact that some of our farmers apprehended considerable difficulty in having an agricultural exhibition during the last fall which would not have been regarded as an entire failure, and therefore suggested the propriety of deferring the annual fair, but the members of the Board of Managers thought otherwise, and the result was, that an exhibition was held, which proved as successful as the state of the country and the disadvantages before alluded to, would warrant, and the most hopeful members of the Society anticipated.

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## HOLMES COUNTY.

This Society held its tenth Annual Fair at Millersburg, on the 9th, 10th and 11th days of October, 1861.

There was a large number in attendance each day. The number of members was only sixty. The payment of one dollar constitutes membership, and entitles heads of families and minors of such members to make entries. The whole number of entries was two hundred.

The Society is clear of debt, and in a good condition.

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## HURON COUNTY.

The Seventh Annual Fair of the Huron County Agricultural Society was held at Norwalk, on the 2d, 3d and 4th days of October, 1861. Like the Fair of 1860, it was more largely attended than any preceding one, and evinced that the interest in agriculture is not on the wane in Huron county.

In the last annual report, it was stated that the Society had reduced the number of its managers from 19 to 5, and adopted the pay system, hoping thereby to secure better attendance and greater efficiency. The expectations of the friends of the system have been more than realized. The operations of the Society have been more systematic than heretofore, and the Society's interests have received better attention from the managers than during the last few preceding years at least During the past year, at the suggestion of the Society's efficient and attentive President, the system of issuing family tickets was abolished, and every person required to pay a fee at each entrance during the Fair, with good results. The finances of the Association are in excellent condition, showing a balance in the treasury of nearly $500.

Number of members, 228.

The principal crops raised in this county are wheat, corn, oats, grass and potatoes. There were produced in the year 1861, by estimate, about 275,000 bushels of wheat, averaging by estimate also, 13½ bushels per acre; 900,000 bushels of corn, averaging 33 bushels; 500,000 bushels of oats, averaging 33 bushels; 45,000 tons of hay, averaging 1¼ tons; 160,000 bushels of potatoes, averaging 105 bushels. The crops raised were generally excellent, and were uninjured, except corn and oats somewhat, by the so-called "army worm," and wheat slightly by weevil, and were all well secured. Agriculture has made no retrograde movement in Huron county during the past year.

## JACKSON COUNTY.

There were no competitors for premiums on crops or other improvements in agriculture.

The Seventh Annual Exhibition of our Society was one of interest to all of our citizens, as was clearly manifested by the unusually large turnout, and particularly encouraging to the agricultural interest of the county, it having been a decided improvement on the exhibitions of the Society for several years past.

We now have a membership of one hundred and ten (110).

The following may be relied on as a correct statement of the principal crops raised in the county:

WHEAT.—Up till the last days of June our wheat crop gave a promising appearance, and would have given us an average yield of 15 bushels; but after that time, before harvested, was so damaged by the "*midge,*" that the average yield did not exceed 8 bushels to the acre.

CORN.—Our corn crop was so damaged by the *grub worm,* in the fore part of the season, that the average yield will not exceed 15 bushels to the acre.

OATS.—Our oat crop was an average yield.

POTATOES.—Enough for our consumption, but not exceeding half the usual average yield.

**Hay.**—An average yield and excellent in quality.

**Horses.**—Tolerable, and improving all the time.

**Cattle.**—Some fine herds in this county, and their stock is increasing fast.

The past season was remarkable for cold and drought, which had a tendency to injure agricultural products.

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## KNOX COUNTY.

The Annual Fair was held in the city of Mount Vernon, on the 9th, 10th and 11th days of October. The attendance was not as large nor the receipts so great as on last year. We had advertised for September 25th, 26th and 27th, but President Lincoln, without consulting our wishes, appointed the National Fast on the 26th; being our second day, we were compelled to defer ours for two weeks, which, unfortunately, threw us on the same days with the Hartford Fair, and many of our members were members of that Society, consequently our attendance and show of stock was not as good as it otherwise might have been, the dry season affecting seriously our show of farm products. Notwithstanding, we consider our fair a complete success. At no time in the history of our Society have our farmers felt so deep an interest in its prosperity.

Present number of members about four hundred.

Wheat, corn, oats, hay and potatoes are the principal crops; but rye, barley, flax, clover and timothy seeds, beans, &c., are raised in considerable quantities.

Sorghum is raised to some extent, and a considerable quantity of syrup made. Maple sugar and molasses are made to some extent.

Apples are raised in large quantities for home consumption and for exportation, in a dried state. Very few peaches raised in the county. Pears, quinces, cherries, grapes, strawberries, currants, gooseberries, raspberries, &c., are raised generally for home consumption. Apples and peaches were nearly all destroyed by the late frosts last spring. Grapes in abundance; other fruits medium crop.

Wheat crop the last season good. Corn, oats, hay and potatoe crops light, injured by the dry season.

Considerable attention is paid to raising horses, cattle, sheep and hogs, and to the improvement of the breeds of these animals. Large numbers are marketed abroad.

The midge and Hessian fly injure our wheat crop to some extent. The grub, cut and wire worms give our farmers some trouble. The army worm made its appearance in different parts of the county, but has not done much damage yet. Many of our farmers complain of a worm injuring their corn, about the size of the cut worm, not quite so dark, head red, eats out the heart, and continues until late in June.

Herewith please find Assessor's returns of crops in the Auditor's office. This, however, falls far below the actual amount, as I find that one of our best wheat townships returns but 250 acres, while some run as high as 1,100. The last season was unfavorable for agriculture. March and April wet and cold, and but one rain from June 5th until late in September ; the fall very pleasant and dry.

*Abstracts of Assessor's Returns of Crops.*

| Acres. | Bushels. | Average bush. per acre. |
|---|---|---|
| 19,685 | 258,461 wheat. | 13 |
| 3,791 | 41,087 rye. | $10\frac{8}{10}$ |
| 429 | 9,525 barley. | 22 |
| 30,412 | 1,237,729 corn. | $40\frac{6}{10}$ |
| 1,214 | 11,310 buckwheat. | $9\frac{3}{16}$ |
| 14,847 | 490,767 oats. | 33 |
| 22,265 | 32,433 tons hay. | $1\frac{4}{10}$ tons. |
| 997 | 103,961 bus. potatoes. | 104 bush. |
| | 573,710 pounds butter. | |
| | 26,584 pounds cheese. | |

440 sheep killed, value .............................. \$939 60

271 sheep injured, value of injury ...................... \$409 00

## LAKE COUNTY.

The Eleventh Annual Fair, for the year 1861, was held at Painesville, on the 19th, 20th, and 21st days of September, 1861. The weather was cool, but pleasant. The attendance was about as large as usual, but the receipts were not quite equal to those of the last year, owing probably to the fact that the public mind was so much engrossed with matters pertaining to the war. It is perhaps also for that reason that the entries in many, if not all, of the departments were less in number than at previous Fairs, though there was no deterioration in their quality.

Owing to the increase of expenses consequent upon a state of domestic rebellion, and to the derangement in business it produces, some of the members of the Board of Managers were in favor of postponing this "annual reunion" of the industrial classes of the county until another, and, as they hoped, a more favorable year; but, after consultation with members of the Society, it was deemed advisable to go on with our Fair as usual; and the large attendance and the general interest taken were a happy disappointment to the managers, and a cheerful assurance of the utility of our Society, and of the firm place it has in the hearts of all classes of our people.

In regard to the condition of our agricultural and industrial pursuits, we may say that marked progress is being made in all their departments.

**Horses.**—There are a great many raised in this county. A good deal of attention has been given to breeding Morgans, but farmers generally think them too small, better adapted to the hills of New England than the level country of the

West. There have been some horses sold the past season for the United States service, and would have been many more, had they not been too small for the army standard. Our President, Selleck Warren, introduced two years since a Kentucky-bred Messenger horse, that is expected to make some improvement in our stock. He is large, of great action, and of fine appearance.

CATTLE.—There are no native cattle left among us. The enterprise of our farmers has filled our pastures with blood and grade stock, to the exclusion of the native breeds, to such an extent that it would be about as difficult to find in our county a specimen of a native animal as it would of the buffalo.

MULES—For the last two or three years increased attention has been given to this class of stock, and the number of fine animals is rapidly increasing.

SHEEP.—If the quality of wool is an index of our stock of sheep, our county, in this branch of stock raising, will rank second to but few in the State. For several years importations from the best Vermont flocks have spread among us the fine grades of wool; and the increased weight of fleece, as well as an advanced price over common wools, have conspired to drive the common sheep almost entirely from our limits.

HOGS.—There is perhaps no kind of stock that has been more improved here than swine. We have several farmers who make hogs almost a specialty; and we think, without looking at statistics to verify our statement, that we have taken more than an average share of premiums on hogs at our State Fairs. However that may be, of one thing we are assured, that, while a few years ago hogs that would weigh 300 pounds were considered of good size, now if they do not weigh from 400 to 500 pounds they rank as common.

The price of pork is lower now than it has been for twenty years, selling for $3 per 100 pounds.

WHEAT.—For the last two years the wheat crop has been fair, the berry plump, and yield satisfactory. Though not strictly a wheat district, yet, owing to past success, more wheat is being sown than formerly.

Price per bushel, for red winter, 95 cents; white, $1.

RYE—Is not much cultivated, though it grows well, and is a sure crop.

OATS—Our Fair this year not as good as last. Yield from 30 to 60 bushels per acre. Average price, 22 cents per bushel.

CORN.—A fair crop, with a great breadth of ground planted. Price, shelled, from 35 to 37½ cents per bushel.

BARLEY.—Is an uncertain crop, and not a great quantity raised.

BUCKWHEAT.—But little grown, and that for home use. Price, 50 cents per bushel.

TIMOTHY.—Is principally grown of good quality, and an average crop. Price, $7 to $8 per ton.

SORGHUM.—Increased attention is being paid to the culture of this plant. The first attempts at raising it were discouraging, owing to the quality of the molasses made from it; but the experience of the last two years, especially the last, has demonstrated that, with ripe cane, molasses can be made of a quality equal to the best New Orleans. So fully has this fact been established, that the coming season will witness a greater breadth of sorghum planted than ever before.

Fruits.—If there is any one thing that our people have paid special attention to for the past twenty years and more, it is to the cultivation of fruits, particularly the apple. There are probably more good varieties of the apple to be found in this county than in any other in the State. During the period before mentioned, there have annually left here, for all portions of the United States and the Canadas, parties of grafters, who have extended their operations as far as Louisiana and Texas on the southwest, and Florida on the southeast, taking with them the choicest fruits of this section, and bringing back any superior variety they may have met with on the way. This practice has given us unusual facilities for improving our fruit. The past year was unfavorable to the apple crop, and our exhibition was poor compared with former years; but for the year 1860 it was unparalleled for variety, size, and flavor.

Pears do not succeed so well, the soil not favoring their growth. As a consequence, but little attention is paid to their cultivation.

Peaches do well, and all the fine varieties are found with us. The last season was unfavorable, and the crop poor.

Grapes thrive finely, and considerable attention is being paid to vineyards. The Catawba is the favorite grape for wine.

Strawberries are raised in great abundance. Wilson's Albany Seedling, Early Scarlet, and Black Prince, are among the favorites.

Raspberries, currants, cherries, and other small fruits, are plentiful.

Honey and Bees.—Receive considerable attention. Price of honey, from 12½ to 14 cents a pound.

Butter and Cheese.—In these departments our farmers think they have little left to learn.

Potatoes.—A crop that receives particular attention. Large quantities are exported to New York, Cincinnati, and Pittsburg, some farmers growing as many as fifty acres. The Peach Blow is the favorite just now.

## LICKING COUNTY.

The Fourteenth Annual Fair of the Licking County Agricultural Society was held at the Fair Grounds near Newark, Ohio, on Wednesday, Thursday, and Friday, the 2d, 3d, and 4th days of October, A. D. 1861. The weather was fine, the roads good, and, considering the extent to which the war had engrossed the minds of our people (this county, at the present writing, having furnished fourteen hundred and fifty volunteers), the attendance was large.

Entries.—Horses, 123; cattle, 79; sheep, 136; hogs, 49; goats, 15; jacks, 3; all other entries, 405. Total, 810.

The people of the county fully appreciate the advantages of the County Fair. The number of entries would doubtless have been greater, but for a rule of the Board, requiring a per cent. on the premium to be advanced by the exhibiter; but the rule is approved by those of our citizens who have had the greatest observation and experience in the management of County Fairs.

The display in the several departments, especially in that of horses, cattle, and sheep, evidences a very decided improvement in the quality of the exhibitions.

The culture of the Cashmere goat is an enterprise which our Board has to some extent encouraged. Two years ago there was in this class but one entry, last year eight, and this year fifteen. The Cashmere seems well adapted to this climate, and the cross with the common goat is successful. There are now in this county about two hundred thoroughbred and grade Cashmere goats.

The establishment, in some of the townships, of Township Fairs, and in others the formation of societies for the discussion of agricultural subjects and the mutual improvement of their members in agricultural science, indicate a proper appreciation of the relative importance of agricultural pursuits.

It is very desirable to have the attendance on each day of the Fair as equal as possible, and to furnish to exhibiters the means of knowing on what day, and time of day, each animal or article will be exhibited. This was satisfactorily effected by a printed programme, setting forth the order of exercises, on slips of convenient size, distributed throughout the county.

## LOGAN COUNTY.

The Logan County Agricultural Society have the honor to make to you their report for the past year.

The society held its annual Fair on the 24th, 25th, 26th and 27th days of September, and, considering the difficulties in which our county is involved, and the war excitement, it was successful beyond expectation. The number of entries were as follows:

| | |
|---|---|
| Cattle | 63 |
| Horses | 215 |
| Jacks and mules | 27 |
| Sheep | 39 |
| Hogs | 16 |
| Poultry | 10 |
| Total live stock | 370 |
| In all other classes | 266 |
| Total | 636 |

## LORAIN COUNTY.

The sixteenth annual Fair of the Lorain County Agricultural Society came off at Elyria on the 25th, 26th, 27th and 28th days of September. The Fair, taking all things into consideration, was a good one, and may be considered equal to any of its predecessors; but, at the same time, the Fair had many things to contend with; among them may be named the general one of the war spirit which pervades all classes, and particularly the agriculturists. Then again President Lincoln's fast came on the second and most important day of the Fair, and to cap the chapter of set-backs to which we were subjected, it rained on each and every day of the last three of our Fair. But, notwithstanding all this, there was a good show of stock of all kinds, a fair show of fruit, garden vegetables, domestic manufactures, ornamental work, and military, and a good turn-out of the people.

Whole number of entries, 903.

The Lorain County Agricultural Society may be considered in a generally flourishing condition, and a fixed and permanent institution. The directors had arranged a very liberal premium list, and had it not been for the fast day and the rain, our sixteenth annual Fair would have far exceeded any previous Fairs, and as it was, the number of entries and the receipts were greater than any other Fair ever held by the Society.

The past season has been, so far as the weather was concerned, one of the most delightful The crops have been about an average. Wheat was good; oats and barley fair; hay not quite up to an average; corn about an average crop; potatoes not up to the average; fruit, but little. But take the season, all in all, it has been a pleasant and prosperous one to all classes, and particularly to the husbandman; always setting aside the evils produced by the great rebellion, which is desolating many a fireside even in Lorain county.

The last day of the Fair was devoted mainly to the military. A flag was presented to the best military company on exhibition. There were seven military companies, all of them well uniformed and drilled. The banner was awarded to the "Chase Cadets," of Oberlin, Capt W. H. Rice.

Number of members of the society, 422.

Butter made in the county 1861, 1,216,200; cheese, 1,325,181. Average bushels per acre 1861: wheat, 16; corn, 39; oats, 34; rye, 18; barley, 22; buckwheat, 18; potatoes, 119.

The striking characteristics for the season of 1861, were a cold, backward spring, with a "killing frost" on the morning of May 2d, and from that time to the end of the year the weather was delightful; so pleasant and fine was the season that if it had been made to order it could not have been beat. The grass-hoppers, in some portions of the county, and the army worm, so called, in other portions, were very destructive to potatoes and many other crops.

The general prospects of agriculture are good in Lorain county. Our farmers are beginning to comprehend the importance of more thorough agriculture, and among the most important that may be named in this respect is underdraining.

When the cultivated lands of our county are thoroughly underdrained, then, and *not till then*, will Lorain county produce to its full capacity.

## LUCAS COUNTY.

The period of dissatisfaction in the history of this society was fully reached at the close of the last year, and it was impossible to persuade our best men to accept and hold the offices of the society. The undersigned was, therefore, elected president, and acted also as secretary. We held the fourth Fair at Toledo, on the 24th and 25th of September. The show was, in some respects, inferior to the last; but in horses and implements superior. The display of fruit was good. The ladies contributed liberally the products of domestic industry, and the show of rare flowers and leaf plants by Mr. Lenk was a brilliant feature of the exhibition. Our people, always generous on such occasions, filled the grounds. The "Gallant Fourteenth" favored us with a dress parade. Our finances are improved and sound, and, with a good board of officers for the ensuing year, we are quite hopeful.

Our county is improving, the climate is favorable, no serious drouth has affected this region in the ten years of my residence here. The crops of grass, corn, potatoes and fruit are unusually sure, and command good prices, so many and diverse markets are opened to us by the numerous and convenient channels of commerce. The system of drainage provided for in our ditch laws is working a cure for most of the disadvantages of the "north-west," and it may be safely claimed that no portion of the country now offers better inducements to the enterprise of the young farmers of Ohio than this.

Respectfully,
DARWIN E. GARDNER.

## MADISON COUNTY.

Our Society is in a more flourishing condition than since its organization, and during the past year has liquidated a debt of over $300.

During the last fair, which was held on the 4th, 5th and 6th of September, 1861, no family tickets were sold, and we find the sale of single tickets more remunerative and equally satisfactory. The fair was not so good in point of display as on former occasions, and in this only were we disappointed.

This, however, must be attributed to the distracted condition of the country, and not to lack of interest or failure on the part of the management.

The crops were very good, although not equal to the preceding year, and may be termed a fair average of all the products.

The crop of corn may be estimated at one and a half million of bushels, and the average product, 50 bushels per acre; wheat two hundred and fifty thousand bushels, and the average product, 20 bushels per acre. The season was very good.

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## MAHONING COUNTY.

Our fair was held on the 1st, 2d, 3d and 4th of October, 1861. It would be exceedingly tedious to give a lengthy account of the proceedings of the Agricultural Society of this county, but suffice it to say, that the Society is in a flourishing condition, its success during the last year being unequalled by any previous year since its earliest organization. The board as a general thing has been filled by the most energetic and active men in the county, men who have a concern for the welfare of the agricultural, manufacturing and mechanical interest of the county.

The number of members during the last year was three hundred and twenty.

The present prospects for its usefulness and progress have heretofore been unparalleled, and the finances are now in a better and more encouraging condition than they have been for several years past, and the members generally evince a determination to render the organization permanent in its character and useful in its work.

The crops upon an average have been excellent during the past year. We have no striking characteristics to report, nothing of any importance having happened to the crops of our county during the last year.

The different crops have been somewhat larger and of equally as good quality for the last year as they have been heretofore, and abundantly repaying the hand of industry and honest toil.

About the only destructive insects that have done any damage to the growing crops have been the grass-hoppers; they done some damage to the hay, and also injured the corn some. While the damage done to the hay crop has raised the price of hay per ton to a price somewhat higher than usual, yet the scarcity of it is not generally felt by our farmers.

As to a general view of agriculture in this county, we can only say, that the agricultural interests of the county are in a healthy and flourishing condition, the land generally being under a fine state of cultivation and usually producing fair crops, which are gradually and steadily enriching the county.

The principal crops raised in the county are wheat, of which there was sown during the last year, (as nearly as we can now ascertain) about 10,837 acres, and yielding on an average about 13 bushels per acre; rye, number of acres sown about 1,180; corn, number of acres planted during the last year, 13,742, and producing on an average about 30 bushels to the acre; oats, number of acres sown about 12,425, and producing about 34 bushels to the acre on an average.

There was about 31,850 acres of meadow, which produced about 46,875 tons of hay.

The horses of the county are usually good. The farmers mostly look well to the "breed" of their horses and have the stock now well improved.

Some of the finest cattle are raised in this county that can be found in Northern Ohio. Sheep of all kinds improving constantly. Much credit is due our farmers for their improvement in this department of stock.

## MARION COUNTY.

The eleventh annual exhibition of the Marion County Agricultural Society, was advertised to be held on the Society s grounds, on 25th, 26th and 27th days of September, but owing to the National Fast being on the 26th, was postponed to the 2d, 3d and 4th days of October, 1861. The fair was what might be considered good these war times. Total number of entries 523.

There was no competition for premiums on field crops, the objection raised by most persons, is in being compelled to comply with the law; the expense and trouble is more than the majority of agriculturists are willing to undergo, especially on wheat, oats, rye and grass, as they come in a season of the year that time is precious with farmers. The number of members for 1861, was 94.

Marion county may be considered a grazing and grain growing county; the southern and south-eastern to grain growing, the northern and western to grazing. The principal crops raised are, corn, hay, wheat, oats, buckwheat and rye, the three first named crops will be below an average this year.

Horses.—There has been considerable pains taken of late years to improve the horse stock, several thorough bred horses having been introduced in the county, which have given every satisfaction. Several of our enterprising stock growers introduced a French Norman draft horse this season, but had the misfortune to lose him by disease, soon after. There has been quite a number of horses shipped from this county for the army, as near as can be ascertained 1,000 head, averaging $85 00 per head, making $85,000 for horses. The number of horses returned by assessors were 7,689 head, valued at $390,066. The number of entries at the fair were 83 head, most of which were very good.

Mules.—There are some mules raised in this county, mostly sent south, to Kentucky, at weaning time; value this season $30 00, other seasons $40 00 to $60 00. The number of mules returned by assessors were 81 head, valued at $5,480. The number of entries at the fair was three.

Cattle.—In the stock of cattle there has been a great improvement in the last few years, mostly in Short-Horn and grade Short-Horn cattle. The grade cattle in this county are very good, some competing successfully with thorough bred cattle for sweepstake premiums (Why not have a grade list in State Fair premium list, if the great portion of our cattle in the State are to be improved, it must be by raising of grade cattle? why, therefore, not encourage the breeding of grade cattle by offering premiums for the best grades?) The number of cattle shipped from this county to the Eastern market is large, but we have no means of ascertaining the exact number. The number of cattle returned by assessors were 19,535 head, valued at $232,060; the number of entries of cattle at the fair was 43 thorough bred cattle, and 32 native and grade cattle, making a total of 75 entries.

Sheep.—There was considerable competition in the sheep department this season, more than ever before, and the sheep shown were very good, mostly heavy wool sheep, of the Spanish Merino variety. The sheep interest of Marion county has improved rapidly for the last few years. There has been of late years, sheep imported here from Vermont, Pennsylvania and the eastern part of this State. The number of sheep in the county returned by assessors was 60,463, valued at $180,536. The number of entries were 71 fine and heavy wool, and seven long wool, making 78 entries.

Hogs.—There has been a great improvement in the breed of hogs for the last few years, the old long nosed and high bristled sorts have given away to the improved breeds. Suffolks, Leicestershire and Chester Whites are about the leading varieties. There were from assessors returns 37,904 head, valued at $102,878. There were 21 entries in small breeds and 14 in large breeds, making 35 entries.

Mechanical Productions.—The mechanical productions at our fair were well represented, mostly of home manufacture, except farming utensils, which are mostly imported into this county. There were some plows and other farm implements of home manufacture that done credit to the makers. If there were more of our implements made in this county, it would be better for the agricultural interest of the county. The repairs can be better, cheaper and quicker done where the articles are manufactured.

Fruits.—The fruit crop this season was almost a failure, so far as peaches and apples are concerned. The grape crop was good, but late. The grape interest of this county is on the increase; most vineyards that are bearing are doing well.

Chinese Sugar Cane.—There has been considerable sugar cane raised this season in this county, and manufactured into syrup, principally by home process; some was manufactured by Evaporators which proved to be of better quality.

Vegetables.—The show in this class was behind last season, on account of the season being so dry.

Grain and Seeds.—The show in this class was very good.

Floral Hall—We are sorry to say was poorly represented, but we hope in the future to be able to report better for the ladies of Marion county.

According to assessors returns for 1861, their were 11,058 acres of wheat, producing 151,329 bushels; 480 acres of rye, producing 5,487 bushels; 86 acres of barley, producing 1,439 bushels; 539 acres of buckwheat, producing 7,212 bushels; 36,639 acres of corn, producing 1,411,028 bushels; 8,839 acres of oats, producing 294,993 bushels; 18,152 acres of meadow, producing 24,789 tons of hay; 817 acres of potatoes, producing 850,052 bushels, and 306,353 pounds of butter and 5,449 pounds of cheese. Total value of personal property in the county, $1,861,332.

As labor becomes scarce and high, more farm machinery is introduced. There has been quite a number of reaping and mowing machines and threshing machines sold in this county this season.

The army worm destroyed considerable in the southeast portion of the county, mostly grass and oats; the midge or weevil injured the wheat crop to some extent; they were quite numerous, but appearing late in the season did not do much damage. They made their appearance about the first of July, when the wheat was very near out of the milky state. The wire worm done considerable damage to the corn crop at planting time.

According to the estimate of poultry dealers, there are about 60 tons of turkeys to send to Eastern markets, valued at 4 cents per pound, and about 120 tons of other fowls, valued at 2½ cents per pound, making over $10,000 for poultry.

We have five acres enclosed in fair grounds, valued at $500; value of buildings on same $200.

## MEDINA COUNTY.

The Medina County Agricultural Society held their annual Fair at Medina, October 10th, 11th and 12th, A. D. 1861. We had a good time at our annual meeting, and the display of stock was never better. The society, however, did very well, considering the former pull-backs it has received, and the disadvantages it has labored under. Many of the Town Fairs, which for two or three years past have been in full blast, this year failed up, as the saying is; consequently, the County Fair will do better when once over the difficulty these Town Fairs have thrown in their way. People, after seeing all at a Township Fair, get tired, and conclude not to attend the County Fair; therefore, it is better for the one to do away with the other. The prospect now is that this society will be a permanent one, and have a good effect on the farming community. The effect so far, since its organization, has been first rate.

Owing to a deranged state of the books heretofore kept, the list of members cannot be correctly ascertained—probably about 250—but this number we have to guess at. We intend to arrange matters on a better foundation this winter, and a committee is already out for the purpose of purchasing a permanent ground for this society to hold forth on hereafter.

| | |
|---|---|
| Premiums awarded on live stock | $286 00 |
| " " on other departments | 97 55 |

The principal crops raised in this county are wheat, rye, barley, corn, buckwheat, oats, hay, potatoes and beans. As this county is a better grazing than grain county, our grain product per acre will not be as much as in some other counties, but our cattle and sheep will compare with any county in the State. The only draw-back on sheep has been the dogs, of which he have our share, and were there a good round tax placed on each dog there would be less dogs and more sheep throughout the whole State of Ohio, and consequently a great benefit would be conferred on the sheep growers and agriculturists generally.

The amount of wheat and other crops raised in this county cannot be correctly estimated. We do not get any statistics until the assessors' report in the spring, but we must guess at it, I suppose:

| | Acres. | Bushels. | Average. |
|---|---|---|---|
| Wheat.................................. | 12,290 | 170,000 | 13 |
| Rye.................................. | 900 | 11,660 | 13 |
| Barley.................................. | 400 | 8,000 | 20 |
| Corn.................................. | 16,000 | 620 000 | 40 |
| Buckwheat.................................. | 400 | 5,000 | 13 |
| Oats.................................. | 12,800 | 475,000 | 37 |
| Potatoes.................................. | 1,300 | 140,000 | 100 |
| Coal.................................. | ...... | 2,000 | ... |
| Hay.................................. | 37,000 | 40,000 tons. | 1 |

Our dairy products are as follows: Butter, 936,700 lbs.; cheese, 771,220 lbs. This is supposed to be below the correct amount of dairy products by quite a large amount.

We have no statistics in regard to the wool product, but it is very large. In my statistics obtained at the auditor's office the valuation of sheep injured and killed by dogs amounts to about $1,000; quite a loss to a farming community of the size of our county. The past season was dry, but some crops were very good. Grass was not as good as in former years. The oats, corn and grass were injured by the army worm, grass-hopper and cut worm. The army worm was very destructive; they traveled over acres of crops, and destroyed them as they went. It did appear that they were sent as a plague; they came by the ten thousand everywhere. The grass-hoppers were very destructive in some localities, but not as plenty or as destructive as the army worm. They appeared to take a great liking to growing oats; in some instances they passed around farms where there were no oats, and again came together on some adjoining farm, where oats were growing, entirely or nearly destroying the whole field.

The fruit crop is good, but not as good as usual. The worm affected the apple crop very bad this year. Peaches were no crop at all; we don't depend on them of late years Perhaps by underdraining, and some other improvements, the peach crop might be partially saved, but at present it is a failure every year.

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## MIAMI COUNTY.

The fifteenth annual Fair of the Miami County Agricultural Society was held at Troy, September 24th, 25th, 26th and 27th, 1861.

Owing to the unhappy condition of the country, and that over twelve hundred of our citizens had enlisted in the war, a large proportion of whom were connected with the agricultural interest of the county, it was a matter of doubt whether to hold a Fair or not, but, when the experiment was tried, to the gratification of all. Those who remained at home were fully alive to the necessity of keeping the agricultural interest of the county up to its full standard, so much so, that our Fair, instead of being a failure, was a complete success.

The number of entries were 813, falling a little short of the number last year. Our organization contains a membership of 600.

The success attending our last Fair, under the circumstances of the political troubles of our country, gives an earnest of future usefulness very gratifying to the members of the society.

The horse show was the best ever had in the county, embracing all the different stocks in great perfection. Cattle, owing to the indifference and bad feeling among cattle growers of the county, the exhibit was poor, both as to quantity and quality.

There were no competitors for field crops.

The principal crops raised in the county are wheat, corn and barley. The average yield of wheat is 13 bushels per acre ; corn 35 bushels per acre ; barley good ; oats fair crop.

The summer was unusually cold, thereby retarding the growth of our corn crop, which is the principal cause of the crop falling short of former years.

The present crop of growing wheat has suffered from the fly. Invariably on ground upon which wheat was raised last year, and from all experience, we find the policy of sowing wheat successively upon the same ground proves more or less subject to destruction from the ravages of the fly, and should be discontinued.

## MONROE COUNTY.

We herewith present the annual report of the Monroe County Agricultural Society.

The Fair was held at Woodsfield, September 18th, 19th and 20th, 1861. The whole number of entries for this year was 407; which, in view of the excited state of the public mind over the unhappy condition of our country, and the consequent lack of interest in agricultural pursuits, was considered quite a success.

The number of members for the year 1861 was 150.

The principal agricultural productions of the county are tobacco, wheat, corn, oats, buckwheat, hay and potatoes. Sorghum was extensively cultivated this year ; it is thought that sufficient was raised to supply the county.

## MONTGOMERY COUNTY.

The Tenth Annual Fair of the Montgomery County Agricultural Society was held on their beautifully located Fair Grounds in the southern part of the city of Dayton, on the 2d, 3d, and 4th days of October, 1861. The Board having had the experience of holding our Fair after the State Fair on last year, thereby diminishing our receipts from eight hundred to one thousand dollars less than our receipts were for several years previous to holding the State Fair, again this year the State Board having determined to hold their Fair on our grounds, and having set the time so early in September that we could not advantageously hold our Fair before, thereby was compelled to hold no Fair, or, equivalent thereto, to hold it after the State Fair, which was done, believing at the same time our loss would be equal if not more than last year, which has proven, we are sorry to say, to be more.

The Board, however, do not feel discouraged. When we refer to the entries made and premiums awarded at the State Fair to the citizens of Montgomery county, thereby warranting us that it was not for want of enterprise or energy on their part, but that one grand Fair was sufficient for the times, we feel assured in saying for old Montgomery, that if we are, through Divine Providence, permitted to hold another Fair, and times get no worse, that she will do credit to herself, and be second to none in the State.

The number of members in our Society do not tell in numbers, as many other societies, from the fact that an additional dollar is paid to constitute membership. Those only who have paid the additional dollar can be enrolled as voting members. The number of voting members now enrolled is 35. There are some who do not feel like expending an extra dollar until election time, when the list will be somewhat extended.

The principal crops in our county are wheat, rye, corn, barley, potatoes, tobacco, and a considerable quantity of sorghum. This being a new thing, many of our farmers were induced by the nature of circumstances to plant from one-fourth to three acres, the result of which has been very satisfactory, producing in our county from five hundred to one thousand barrels of syrup. We have no doubt, from the feeling now existing, that the increase next year will be one hundred per cent.

The crops of small grain were materially injured this year by the army worm.

Expense of improving our Fair Ground the present year has been but light, say $250, for farm implement hall, stalls, &c.

The number of entries was 538, viz.: thoroughbred horses, 2; horses for general purposes, 51; draft horses, 7; matched horses, 3; light harness horses, 13; saddle horses, 12; fast ring, 13; sweepstakes, 15; jacks and mules, 3; thoroughbred Durham cattle, 22; graded, 10; sweepstakes, 9; fine wool sheep, 10; long wool, 6; graded, 6; mutton, 2; swine, 16; poultry, 20; entries in other departments, 288.

## MORGAN COUNTY.

The officers of the Morgan County Agricultural Society, for the year 1861, respectfully submit the following report:

Our Society during the present year made alterations in the list of premiums offered, by increasing the premium in some of the classes, and reducing it in others, and also by extending some of the classes and diminishing others. The total amount of premiums awarded was about $640. The number of members is 463

The Tenth Annual Fair was held on the grounds of the Society, near McConnelsville, on the 24th, 25th, and 26th days of September. The interest manifested by our farmers and mechanics in the affairs of the Society, though not so flattering as heretofore, yet, considering the derangement in business of all sorts, and the excited state of the public mind, it is perhaps as great as could reasonably be expected. The whole number of entries made in the several classes this year were 665. The number of persons who attended our Fair cannot be stated accurately, but, though less than in 1860, was very respectable. The display of stock, and especially of horses and cattle, has not often been exceeded in numbers, and perhaps never in quality. The display of agricultural products, though respectable, was not so large as in 1860. The various branches of mechanical skill and industry were fairly represented. The display of fruit, excepting grapes, was small, owing to the almost entire failure of apples, peaches, pears, &c, in this county. Our grape crop was unusually fine. Floral Hall was tastefully and beautifully decorated by the ladies, showing their hearty co-operation in the efforts of the Society. In addition to the ordinary decorations, it was further ornamented by a variety of articles, the result of female industry, taste, and skill, surpassing any thing of the kind heretofore exhibited.

It is difficult to make out a satisfactory estimate of the condition of agriculture in this county, or the present prospect of usefulness of the Society, at this time. Such facts as we have been able to procure, are stated below.

*Statement of the Crops raised in Morgan County in* 1861.

| | Acres sown. | Bushels produced. |
|---|---|---|
| Wheat | 17,875 | 123,986 |
| Rye | 326½ | 2 743 |
| Barley | 360½ | 6,042 |
| Buckwheat | 1,696½ | 18,338 |
| Indian corn | 23,335 | 878,692 |
| Oats | 9,176½ | 244,640 |
| Potatoes | 670 | 63,264 |
| Meadow | 15,910½ | 20,450½ tons. |

*Table of Animals, and their Value, in 1861.*

| | No. | Value. |
|---|---|---|
| Horses | 7,769 | $362,429 |
| Mules | 129 | 6,660 |
| Cattle | 20,929 | 188,754 |
| Sheep | 36,091 | 60,949 |
| Hogs | 25,836 | 72,838 |

The season was not unusual, excepting a want of rain during part of the summer. The weevil is about the only insect that injured the crops, and that is decreasing.

## MORROW COUNTY.

The Twelfth Annual Exhibition of the Morrow County Agricultural Society was held on the Society's grounds, at Mount Gilead, the 2d, 3d, and 4th days of October last, and, considering the season, it was a very creditable exhibition. The attendance was good, much better than was expected, when two adjoining counties were holding their Fairs at the same time, and a large portion of our young men were in the army.

The number of exhibiters, and the amount entered and exhibited, was about as large as usual, and would compare favorably with any county exhibition in this region.

The past season was unfavorable to agriculturists, and worse to herticulturists. Corn, the staple cereal, was seriously damaged by drought, especially on high clay ground. Wheat below the average; winter-killed and injured by the fly. Oats injured by drought; below an average. Early potatoes an entire failure; late potatoes good. The grass crop and summer pastures seriously injured by the dry weather through June, July, and August. In fact, every crop must have been affected by the continued dry weather; the southern portion of our county apparently having suffered the most. Clover-seed so late in maturing that very little was secured. The sugar-cane is being cultivated to a considerable extent, I think satisfactorily; almost every neighborhood has an apparatus for making the syrup, and it is fast superseding imported syrups, and many families using it almost to the exclusion of sugar. The fruit crop was seriously injured by the May frost and drought. Apples less than half a crop; peaches and pears none; cherries scarce; grapes and berry fruit a fair yield. But, notwithstanding the frost and drought, as a county we have an abundance for the subsistence of our people, and a large surplus of pork, beef, horses, wheat, corn, oats, flax and timothy-seed, beans, potatoes, wool, and some apples, for exportation.

The financial condition of our Society is somewhat embarrassing. But with a respectable fair ground, well fenced; good, substantial buildings, stalls, pens, &c., and an increasing popularity with the masses, we think, with reasonable financiering, the Society will liquidate the last dollar of indebtedness next year.

## MUSKINGUM COUNTY.

There has been an increased attention to the requisites of good farming displayed by our farmers the past year, and as a consequence, many of them have abundant reason to be glad. The relationship of a skillful and proper adaptation of means to ends, is perhaps mostly to be learned by observation, especially so in the arts of raising stock and of tilling the soil; yet it *may* be learned, and what is more, reduced to actual practice.

We are learning in this county that it costs less to take care of and keep in good condition, on the same feed, stock of good quality, than it does to keep such as are of an inferior description. Hence, there is an increased attention to the improvement of the breeds of our domestic animals, and this is especially observable in the cattle and swine departments. Instead of breeding from "runts" and the miserable "scalawags" of the farmer, many are introducing the shorthorn and other improved varieties, and instead of trying to make pork of "land pikes," Chester Whites, Suffolks, and other varieties are taking their place. In this department we may say (and we feel glad that we can say it) that "the world does move."

The same law of relationship and adaptation is also being learned in reference to the cultivation of the soil. Thorough cultivation, it has been observed, increases much the product of the earth, and we are likewise learning how to adapt our cultivation to our crops. Some amongst us (we would there were more) have realized that "a little farm well tilled" is of more profit, and affords more pleasure in every respect, than a large one half cultivated, and "worked at" in a careless, slip-shod manner.

We are also beginning more fully to realize that the farmer's best bank is the manure pile; that we cannot expect to receive much return for our labor in cultivation, if we never pay back to mother earth what we borrow from her; that the business of impoverishing our goodly soil has been carried far enough, and that it is high time, in this respect, to "turn over a new leaf. Many, we are glad to say, have already done so, and although it will take years of judicious farming to make a very marked improvement, yet we can but be pleased to see a step taken in the right direction. It will only require a succession of such steps to enable us to *know* that farms may be cultivated, year after year, and yet all the time be increasing in fertility and productiveness.

Some of our farmers are giving more attention to the cultivation of fruits, and especially of the grape. The former, with the exception of the smaller fruit, such as strawberries, &c., was mostly destroyed by the frost of the 1st of May last, but the crop of grapes was good, and of blackberries, both wild and cultivated, enormous.

The introduction of the Lambert or Hardin county wheat in this county, has been to some at least of our farmers, a great boon. Many have sown it exclusively, and although its product is not so great as that of the White Blue Stem and some other varieties, yet it has been, from its exemption from the ravages of the midge, a sure crop, and it is thought that with more care in putting it in, and in giving it good ground, its yield may be increased. The wheat crop in this county will not average more than about 10 bushels to the acre for the last year.

The corn crop of 1861 is much inferior to that of 1860. The long continued wet and cold weather in the spring, the ravages of the cut worm and other insect enemies, in connection with the dry weather in June and July, and other causes not necessary to name, have all combined to make the crop much below the average, probably not exceeding 25 bushels to the acre.

The potato crop of this year is also inferior to that of 1860. Some of the causes which operated so much against the production of corn, have had their effect in reducing the yield of potatoes; yet it is supposed the crop will average at least 50 bushels to the acre.

Rye, oats and barley are not much cultivated here, with the exception of the second named. Of oats, the crop has been good, although perhaps not equal to that of 1860. The average is about 25 bushels to the acre.

The crop of hay is likewise much less than it was in 1860 Whether the deficiency is to be attributed principally to the weather, or to the want of proper manuring, or to close feeding in the fall and spring (a very injurious practice), or to all these combined, it may be impossible to say. The average, it is thought, will not exceed 1 ton per acre.

There has been an increased interest manifested in the cultivation of Sorghum, probably induced by the high price of Southern molasses. No doubt exists as to the profit resulting from its proper cultivation, nor is there any reason to think that its culture will, at any future period, be less than at present. Indeed, many of our farmers talk of going more largely into its cultivation, and if their expectations are realized, it will not be long before our county will, in some degree at least, be independent of the sugar plantations of the South.

Our Society held no Fair this year. In May, after we had determined to hold another Muskingum Valley Fair, had our committees appointed to revise and perfect our premium list, and had their report in part before us, we learned that the State authorities had determined to establish a military camp at this place. Several of our citizens, who were also members of our Society, had designated our Fair grounds as the most suitable place for its location, and they applied to us, urging our consent to its establishment upon our grounds. We assented to that application in view of all the circumstances of the case, and especially under the supposition we entertained that the occupancy of the grounds by the military would not be continued so as to preclude us from holding our annual gathering, and accordingly arrangements were entered into by our Board, on the part of the Society, and Mr. Commissary Clark and Mr. Quartermaster Thompson, on the part of the State, for the use of our grounds and buildings for the purposes of a military encampment, and immediately thereafter our grounds were taken possession of by the State, and have been occupied from that time until the present. Thus the establishment and continuance of "Camp Goddard," as the camp here is called, taken in connection with the unsettled state of the country, the general excitement of the public mind, and the stagnation of business, have prevented us from holding our annual festival, and it was necessarily postponed until the coming year.

The number of members of any agricultural society, you are aware, depends very much, if not almost entirely, on the holding of the annual Fair, as large numbers only become such just before or during the time the Fair is held. Yet as it is, we have enough "good men and true" to maintain our organization, and to form a nucleus for further and more extended operations. The number of members is now one hundred.

On the whole, we feel assured that the prospect of extensive usefulness for this Society was never better than at present. It has gained a status that is and must be recognized and acknowledged as far in advance of its former position, and with the aid of the agricultural department of the Patent Office (from which many seeds have been received and distributed by the Secretary), and with that of the information derived from and disseminated by the various agricultural publications, together with the agricultural report of the Patent Office, and that of the State Board, we feel assured that the agricultural world *will move* more and more in harmony with the established relations referred to in the beginning of this report.

## NOBLE COUNTY.

Fair held on the Society's grounds at Sarahsville, October 3d and 4th, 1861. Our Fair was held under very unpropitious circumstances, owing to the great excitement in regard to our national difficulties. The attendance was not as large as usual. The stock exhibited was very fine, showing a decided improvement in our stock within a few years. The exhibition of poultry, farm implements, and domestic manufactures, was very good. There were a few samples of fruit that were very fine, although there was almost an entire failure of fruit in the county this season. A good display of Irish and sweet potatoes, and good pumpkins and squashes were exhibited.

The principal agricultural products of this county are wheat, corn, oats, potatoes, tobacco, hay, and Sorghum. We have no means by which we can give you the aggregate amount. Our wheat crop was much better this year than it has been for several years. The corn crop was injured very much in some parts by the grub worm; some fields were entirely destroyed, and some of the meadows were also very seriously injured by this insect. The oat crop was an average. Potatoes, about an average; some crops have been injured by the rot. The Sorghum has become a very important crop in this county. I have no means of knowing the amount of molasses made in the county, but it is a large amount, nearly enough to supply the county.

Price of wheat, about $1 per bushel; corn, 25c; oats, 20c; potatoes, 35c; hay, $5 per ton.

The fruit crop was an entire failure this year.

## OTTAWA COUNTY.

Our Society did not offer a premium on field crops the past season. The unhappy condition of our country induced our Society to move cautiously the past season, fearing a Fair would not pay expenses, and some members opposed holding a Fair, but on taking a vote they were overruled, and a Fair decided upon, and resulted quite satisfactorily, all things considered.

Our crops have not been troubled with any destructive insects the past season. Our principal crops are wheat, corn, oats, hay, and potatoes. I have no means of giving you the amount raised the past season, and can only say the crop of each was very good—more than an average yield. Wheat now in the ground looks well.

## PICKAWAY COUNTY.

The interest in agricultural Fairs continues unabated in this county. Since the regular organization of our county society, a growing interest has been manifest in our public exhibitions. The annual Fair is a regular event for both old and young in this county.

The earlier exhibitions of our society were more properly "cattle shows" than Fairs, as we now understand them. One of the primary objects in organizing the society being to bring into public notice the deservedly popular herds of thorough bred cattle, which were then and continue to be the pride of the county. From that beginning, our Fairs have now come to be exhibitions, so miscellaneous in their character, that nearly every branch of the agricultural and mechanical pursuits of the county are annually represented. And to this should be added the extraordinary interest taken, and labor bestowed by the ladies in furnishing, decorating and filling the halls devoted to the exhibition of articles manufactured or prepared by them, which at home go to make up so much of the elegancies and luxuries of life.

Our tenth annual Fair was held at Circleville on the 25th, 26th, 27th and 28th days of September, 1861. The total number of entries was 889, being a higher number than was ever before attained in this county. While there was no perceptible falling off in numbers or quality in the cattle department, that of horses and smaller stock was largely increased. The amount awarded in premiums was $772.50. Premiums were paid in cash. The Fair opened with every prospect of success, but an unfavorable change in the weather took place on the second day, which continued during the third. The Fair was continued to the fourth day, but the disappointments occasioned by the rain and cold of the two previous days had driven the people to their homes, and the final result was a slim attendance and light receipts—leaving the society in debt.

The number of members who now compose the society is 200. The society is managed by a board of fifteen directors, one being elected from each township

**annually by the members of the society. The board, in turn, elect executive officers.**

**Our Fair grounds contain 19 acres of land, and possess a natural adaptation to the purpose, that no human engineering could improve upon. The inclosure contains three halls, built at a cost of about $700 each, and a fine cottage residence, at a cost of $1,000. The grounds and improvements are valued at $7,000.**

## PORTAGE COUNTY.

Our annual Fair was held on the 18th and 19th days of September, 1861. There were several entries on crops and farms, but no statement being made in accordance with the rules and regulations, no premiums were awarded. We had very nice weather for our Fair, and, taking all our circumstances into consideration, it was decidedly a success, far exceeding the expectations of the most sanguine. Since our Fair several old members, who had left us, have come back, and say they are with us again, heart and hand. I think that by careful management, most of those who have become dissatisfied within the past year or two, will again unite with us.

Our show this year was considered by many to consist of the best articles they had ever seen at a County Fair. The number of entries was not quite as large as some years. The show of cattle was small, owing to pastures being short, but most of them were good blood. The show of horses was good, both in number and quality. The show of sheep and swine was large, and most of them would not disgrace even a State Fair. Floral Hall was not as well filled as we might wish, but still it was far from being empty. Farm products were very plenty, and of the nicest quality. Our show of mechanical items was small, as usual, owing to the small number of shops in our county. Taking it altogether, every one was satisfied, and if times are usually good, we will have a Fair next year worthy of the good cause.

The society have built a new Floral Hall this season, and now have a ground and buildings very well adapted to their wants.

In our county we also have an agricultural society upon an independent basis, and several township societies, which are doing considerable good, and their effects can be plainly seen. For the maxim, "This raises better crops—makes more feed," etc, is taking the place of the old one, "Father always done so." Farmers are finding out that what is worth raising is worth tending, and that no manure no crop. There is still a chance for improvement, and if old Portage don't keep up I am very much surprised. The number of members enrolled upon our books is 509, of whom 300 may safely be called regular, active, paying members

Portage county being on the borders of cheesedom, the northern part of our county is devoted to dairying, while the southern is mostly devoted to grain.

The spring was backward, and farmers looked down-hearted for their corn crop, but the frost held off and it ripened very nice and turned out very well. The weevil almost entirely destroyed late wheat, while early wheat was about an average crop. Oats were very good, where not injured by the army worm and grass hoppers. Early potatoes did not turn out very well, owing to potato bugs and grass-hoppers; but late ones were very nice. The army worm done some damage, but was not as bad as in some places. Grass-hoppers were very plenty, and done a great deal of damage, injuring feed so that dairies have not done more than from one-half to two-thirds as much since the first of July as they otherwise would. The winter injured fruit so that the yield has been very small. There was full an usual amount of grain put in last spring, and this fall rather more than an average amount, and it generally looks well at the present time. According to the best information I have, I think the following is about what crops have yielded per acre on an average: Corn, 65 bushels, ears; oats, 25 bushels; rye, 10 bushels; wheat, 10 bushels; barley, 25 bushels; potatoes, 125 bushels; buckwheat, 20.

## PREBLE COUNTY.

The annual Fair of the Preble County Agricultural Society was held at the society's grounds, near Eaton, on September 16th, 17th, 18th and 19th, 1861. The weather was pleasant. The show of horses was large and very good, showing an unabated interest on the part of raisers of fine stock in the horse line. The show of hogs was never better at any Fair in our county. The sheep department was well represented, in both fine and long wool. The number of cattle entered was small, compared with other years. Specimens of grain exceedingly good. The Horticultural Society of Preble county took control of that department for us, and made a fine show of articles coming in that class. The display was good in everything but apples, which were near a failure in our county this year.

The members of the board felt doubtful early in the season as to the propriety of holding a Fair at all in our county this year, the condition of our country being such as to absorb, more or less, all interests save that of country. But we decided to hold a Fair, and met with good success, considering all things. Every one was pleased, and enjoyed our annual social gathering highly.

## PUTNAM COUNTY.

The Putnam County Agricultural Society having been established in 1855, it being a new thing attracted the attention of the people, and it was believed that the interest then manifested would continue as the county became older, and as its resources would be more fully developed the society would be able to purchase suitable Fair grounds, and make the necessary improvements thereon, second to none in the State, considering the newness of the county and its sparse population. But, to the disappointment of the friends of the society, the interest of the farmers and mechanics gradually diminished, until it was feared that an effort this year would prove a failure; but, by the perseverance and untiring energy of the board, assisted by the friends of the society, suitable grounds, containing about 12 acres, were purchased; and, through the liberal contributions of the citizens of the county, a substantial plank fence was erected around said grounds, and temporary buildings for the convenience of exhibiters; and on the 2d, 3d and 4th days of October our seventh annual Fair was held at Ottawa; and, contrary to the expectations of the most sanguine. the attendance was large, and the interest manifested was a sufficient guarantee that the people are determined that the benefits arising from an interchange of sentiments, the improvement in stock, and the spirit of emulation that it creates to excel, shall continue until Putnam becomes the banner county of the north-west. The exhibition of horses was large, compared with previous years, and among them several Morgans, which received due attention. The number of cattle entered was respectable, there being some fine Durhams that would have done credit to an older county, and it is believed would have compared favorably with the best at the State Fair. The pens of sheep done credit to the owners; among them was a lot of French merinoes, taken from the flock of C. T. Pomeroy, who has done much to improve the stock of this county. The pens of hogs showed a great improvement over previous Fairs, there being a number of white Chesters, Suffolks, and other valuable breeds.

Several mules and one fine jack, the first exhibited in this county, were on exhibition. Farm implements and manufactured articles received the attention justly due their importance.

The farmers may well be proud of the great variety of vegetables, their mammoth growths, and nutritiousness, that were entered for competition. And we challenge the ladies of adjoining counties to compete with those of Putnam in the many articles furnished by them so indispensable to the success of a Fair. The past three seasons have been very sore ones for the horticulturist of this county, owing to the ravages made upon fruit trees, (with the exception of peaches,) by the loop worm, which spared not the forest; therefore, the exhibition of fruit, in variety and quality, fell far below what it would have been in ordinary seasons. The farmers of this county having given due attention to procuring the best varieties, by planting and grafting, anticipate large remunerations after their orchards recuperate from the damage they have already sustained.

The weather during the Fair was delightful until the third afternoon, when a rain interfered and cut off entirely the exercises of the ladies on horse-back.

The soil of this county is of various qualities; therefore, it is well adapted to the raising of wheat, corn, rye, oats, barley, potatoes, hay, etc, which accounts for its rapid improvements and the surplus of products that finds ready sale along the line of the Michigan and Dayton railroad, which traverses through the central part of the county. The farmers anticipated a bountiful harvest, the prospect never being more flattering than it was until March and April. The uncommon amount of rain that fell during those months, and the freezing and thawing, had a tendency to injure the crop. However, it was thought that no material damage had been done to it, except on late sown and poorly drained fields. But such was not the case in the month of June; the chess became visible, and a few fed down their fields, and there were a few cases where the bushels of chess exceeded the wheat. Various opinions exist as to the cause. Some attribute it to the sewing of stubble ground; others to foul seed; but the undersigned cannot help but believe that it originated from the unfavorable spring, from the fact that several fields having been cleared during the year 1860, and the seed being clean, produced as much chess as those which were stubble-fields when sowed.

The army worm made its appearance in the month of June, and injured a few fields; therefore, we cannot compute the average above ten bushels to the acre.

The corn crop is more than an average, and we feel safe in saying that fifty bushels to the acre would be a low estimate. Rye, oats, barley, potatoes, hay, etc., were all that a productive soil, favorable season, and good husbandry could produce.

And judging from the fine condition of the few herds that have come under our observation, they have ruminated on plentiful pastures during the summer.

Our county is new, and the change in prices last spring was feared would prove a great detriment to the improvement so necessary, that it may rank with older ones; but such is not the case It is true that the farmers have curtailed their expenses, and in so doing are becoming more independent. They have planted considerable sorghum, the season being favorable; and improved mills having been introduced, the quality of the syrup is very much improved. This stimulates others to try and avoid paying the high prices for sugar; consequently, it is believed that, by opening the numerous sugar orchards, together with the sorghum, they will afford sufficient for home consumption the coming year.

The farming interests of this county have been greatly benefited and advanced by the energetic course pursued for the few last years by the State Board of Agriculture, and the various county and district societies that have been produced and fostered thereby.

## SANDUSKY COUNTY.

The tenth Annual Fair of this Society was held at their grounds at Fremont, on the 2d, 3d and 4th days of October, 1861. The number of entries was not so large as at the previous Fair, and the number in attendance also less. We number at present 348 members.

Of our prospects, we can only say that the interest in the progress and usefulness of our Fairs is not as general as it should be.

The principal crops of the county are wheat, corn, and oats We have no data upon which to found an estimate of the amount of each kind raised. The average yield per acre of wheat, about 15 bushels; of corn, about 35 bushels. The crop of oats the present year was very poor, the average yield about 25 bushels The potato crop a fair yield, but somewhat injured with rot. No particularly destructive insects have injured the crops, except the wire worm, which gave our farmers some trouble in replanting their corn.

The past season has been dry, but no other striking characteristic.

No statements of competitors for premiums on crops were made to the Society the past year.

## SENECA COUNTY.

The eleventh Annual Fair of the Seneca County Agricultural Society was held at Tiffin, on the 2d, 3d and 4th days of October, 1861.

The weather, during the Fair, was very fine until two o'clock P. M. of the last day, when a storm coming up suddenly, closed the exercises prematurely. Notwithstanding the unhappy condition of our country, in which the citizens of our county are deeply interested, the attendance at our annual Fair was large, good order prevailed, and general satisfaction was manifested by those in attendance. The display in some of the departments was not so large as at our last Fair, but there was a good display in all the departments. There were over 900 entries on the Secretary's books. Our grounds were in good condition, and arranged so as to accommodate both exhibiters and visitors.

During the past year, the Board of Managers have erected an additional building on the Fair grounds, for the protection of agricultural implements during the Fair, and have also added raised and bench seats to those already on the grounds.

There appears to be an increasing interest manifested by our mechanics and farmers in our annual exhibitions, a commendable spirit of rivalry for the premiums, and the honor attached to the taking of the same. We think much good has already been done by our annual reunions, in communicating and circulating useful and valuable information, and have confidence that our Society, with the same good management it has heretofore had, will in the future be of great benefit to our agricultural and mechanical community.

The principal agricultural productions of our county are wheat, corn, oats, clover seed, grasses, wool, horses, cattle, swine, and poultry.

The estimated amount of wheat raised is 603,000 bushels; average yield per acre, 14 bushels. Estimated amount of corn raised, 995,000 bushels; average yield per acre, 33 bushels. Estimated amount of oats, 419,000 bushels; average yield per acre, 31 bushels. Estimated amount of hay cured, 40,000 tons; average yield per acre, 1½ tons. Estimated amount of wool raised, 350,000 lbs. annually. Estimated amount of poultry shipped, 200,000 lbs. annually. Estimated amount of eggs shipped, 325,000 dozen annually.

## SHELBY COUNTY.

In my last report I stated that an attempt had been made to establish an agricultural society in our county. It now affords me much pleasure to say that the *Institute* has become a "fixed fact," and in proof of this we wish to offer no better evidence than the fact, that although depressed as our citizens were with the horrors of a civil war staring them in the face, the low price of farm products, the scarcity of money, &c , and when other counties in the State—and in some States even State Societies—were doubtful about the propriety of holding Fairs, and in some cases decided that none should be held, yet ours was more largely attended than it was the year before, and our exhibition in many respects exceeded, both in quantity and quality, the previous year. We cannot help but say that with all this, our Fair was a success, and in my opinion places the Society of Shelby on a par with her sister counties ; and I think from the feeling manifested by our farmers and citizens, that they would not now be willing to be deprived of this social reunion.

The Board of Managers, during the past year, have made large improvements to the grounds. The whole of the twenty acres is now inclosed with a close board fence, seven feet in height, permanently set with the best quality of oak posts and pine plank. We have a fine track, of half a mile in length, good office, fine floral hall, and stalls and pens enough to meet any ordinary demand that may be made on us.

We closed this year with 645 entries.

The competition on field crops was not as large as it might have been, yet we had some fine specimens.

The exhibition of horses, in the various classes, was beyond expectation. A finer display of young stock is rarely seen at a County Fair, and I would remark but seldom at State Fairs. Among the stallions of age, was the "Black Warrior," the "Black Hawk Morgan," and several others worthy of note. Taking this class, from the evidence that we had at our last Fair, if the matter was left with us alone, we would not, at our next, hesitate to give a challenge to the State to meet us.

The display of cattle was not large, yet we had some superior animals, which leads us to believe that an improvement is being made in this class.

The display of hogs was good ; some fine specimens of Chester, Berkshire, and others. In this department we feel more at liberty to speak, as the worthy Judge of our Court (which was in session at that time) was so well pleased with the qualities of one of the animals on exhibition, that he purchased him, and afterwards dismissed the Court and took them out to see his fine specimen of the porcine tribe. Therefore, we feel at liberty to say that the exhibition was good, as we have the opinion of the Court to sustain us.

The display of sheep was good ; we doubt much whether, as a whole, it can be surpassed in the State. I take the liberty here of inserting the weights of some fleeces which I weighed at the time they were shorn, as follows (Spanish Merinos):

| | |
|---|---|
| 2 year old buck, Lord Bacon, 11 months' fleece | 17½ lbs. |
| 1 year old ewe, Maggie, of the Bingham stock | 10½ “ |
| Yearling buck, Jack | 10 “ |
| Yearling ewe, Pop | 10 “ |
| Yearling buck, Saxon | 15½ “ |

And several others, from 6½ to 9½ lbs. These weights I give as correct. The attention of the farmers of this county is fast being turned to the growing of wool, and that of a good quality.

The show of poultry, &c., was limited.

The mechanical department was not as full as we think it might have been. A variety of steel plows was exhibited by C. Kingseed, of this place, which deserve credit, and were by the farmers generally pronounced *good.*

The farm bells exhibited by Mr. Smith, of this place, gave *tone* to the Fair, and deserve credit.

Floral Hall (thanks to the taste of the ladies) was crowded, and admirably arranged, and was a feature in the Fair.

On the whole, we must again say that, under all the circumstances, our Fair was a success. The crops of the county generally have been good, but not commanding such prices as will remunerate the farmer for his labor.

We in this county think that a geological survey of the State is much needed, to enable the farmer more fully to develop the resources of his land, and think that the Legislature, in justice to them, ought to make an appropriation for this object, and that the State Board ought to urge it. A more stringent law for the protection of sheep from the ravages of dogs, is much needed.

## STARK COUNTY.

The twelfth Annual Fair of our County Society was held at the Society's Fair grounds at Canton, on the 2d, 3d and 4th days of October, 1861. Owing to our national difficulties, the officers of the Society were fearful that the usual interest would not be manifested, but were happily disappointed. The number of articles entered for premiums was 1,782, with a great variety of articles for exhibition only. The whole receipts of the Society for 1861, are $2,754 62.

## SUMMIT COUNTY.

The Annual Fair of the Summit County Agricultural Society was held on the 1st, 2d and 3d of October, 1861.

No written statements of competitors for premiums on crops were received.

The Society numbers 520 members. The entries were 754, embracing all departments. The farmer's stock, as well as other products—the manufacturer, the artisan, the florist, and the military—were signally represented, and made very creditable and satisfactory exhibitions. All the displays were exceedingly popular with the mass of people in attendance.

The principal crops raised in the county are wheat, corn, oats and barley. There is but little grain raised in the northern part—embracing the townships of Hudson and Twinsburg—the soil being adapted to grazing.

The average amount of wheat per acre is near 12 bushels; corn, 30; oats, 30; and barley, 20. Vegetables of all kinds yield largely.

The spring of 1861 was cold; frosty nights were frequent until June. The drought was severe from June till September, in some parts. The weevil caused some damage to wheat, nearly destroying some fields. In August the army worm made its appearance, doing but little damage, however, as they were but short lived, and not in numbers sufficient to do great injury.

Horses, cattle and sheep are raised throughout the county.

Whatever may have been deficient in quantity or quality, or of any characteristic of the exhibition, there appeared to have been no want of interest manifested on the part of the community, in their attendance upon it, in that regard. The Akron Fair has become a proverb, vieing favorably with any county exhibition in Ohio.

The finances of the Society are in a most healthy condition; the same marked improvement in its affairs which was inaugurated in 1859, and continued through 1860, has been strikingly evinced in 1861, placing the institution, with its expensive outlays, entirely out of debt, and affording it a handsome surplus on hand.

## TRUMBULL COUNTY.

The Sixteenth Annual Fair of this county was held at Oak Grove, on the 23d, 24th and 25th days of September, 1861; and when the facts that very many of those who have heretofore given efficient aid to the Society, as competitors for premiums and otherwise, were absent in the service of the country, is considered, the result may be regarded as comparing favorably with our fairs of former years. While it is to be regretted that many of our most influential farmers, and others equally interested in the success and perpetuity of the Society, keep aloof from any active participation as members, and consequently their influence is felt to be against the object sought to be attained in the organization of the Society; yet the stock, horses, cattle and sheep, on exhibition, were highly creditable to the wealth and enterprise of the county.

No premiums have been awarded for agricultural improvements, and but a meager list for domestic manufactures, amounting to $28 50. The awards on the last class were made on the following articles, namely: Fulled cloth, domestic plaid, flannel, woolen and cotton carpets, linen diaper, quilts, coverlets, tow and linen cloths, stocking yarn, linen thread, hose, mittens and shirts.

The committees appointed for that purpose have not as yet reported any awards for improvements in agriculture. But three claims for premiums in this department have been presented ; and although no premiums have been awarded, yet it may not be improper in this connection to refer to them.

The Society is now composed of 287 members. We think it manifest to the most common observer, that this Society has been the means of adding largely to the agricultural knowledge and wealth of the people of the county, not only by awakening inquiry upon subjects connected with agriculture alone, but by diffusing more general and enlarged ideas of the economy of breeding and raising the best stock, and selecting and using the most improved mechanical and agricultural implements. And it is hoped and believed that, unless our social and political fabrics dissolve, our Society will long continue a practical illustration of the wisdom of the legislative department of the State. The crops the past sea- have been extensively injured by grasshoppers and potatoe bugs. The army worm has also committed some ravages. The wheat and corn crops were less than an average. Buckwheat was nearly a failure. Flax good. Hay about half a crop. Oats good. Potatoes nearly an average, but diseased somewhat. It is impossible to give any reliable information in detail as to quantity per acre of any crops.

## TUSCARAWAS COUNTY.

The Twelfth Annual Fair of this Society was prevented from being held at its advertised time of exhibition by the grounds being taken possession of, by the military of the State, to use as a camp for recruiting for the U S. army.

We suffered a pecuniary loss in being debarred from holding our annual fair. Our prospects of a successful and paying fair were never so encouraging as it was this fall. Not counting the condition our grounds and improvements will be left in when they leave it, the Society has claims against it, now due, to the amount of $515, which should and would have been paid.

Agriculture is improving in the county. The horses show signs of improvement, and cattle are getting to be of better quality ; also sheep are being improved very much, the Spanish variety is taking the lead, and hogs are not lost sight of in developing their best qualities.

## UNION COUNTY.

The Union County Fair was held on the 25th, 26th, and 27th of September. Compared with last year, there was a marked falling off in the number and quality of the articles exhibited. The attendance was good, and the receipts were $592 76. The expenditures for premiums, &c., were $453 78. Balance on hand of funds of 1861, $138 89. By resolution of the Society, this balance was paid over to the County Commissioners, to be used in relieving soldiers' families. There was a balance on hand of the receipts of 1860 of $517 08, which is still on hand. The Society is out of debt, and its grounds in good order, with ample buildings. The number of members is about 200.

The chief productions, as we have already reported some fifteen times, are hay, corn, wheat, and oats. Little of the farm produce of the county is taken to market, being fed to stock on the farms that produce it. The chief points of shipment are Marysville, New Dover, Unionville, and Milford.

The past season was very dry, and, as a consequence, the corn crop was not so good as usual. On the bottoms and flat swale lands the crop was good. Wheat and oats were about an average crop. Hay was not heavy, owing in part to the drought, and in part to the depredations of the grub-worm; but was generally of excellent quality. Many apprehend that the grub-worm will be worse next season; but I know of no fact that warrants such an apprehension, while I do know of some facts which tend to show that it is without foundation. In 1836 large tracts of country in Muskingum and adjacent counties were troubled with the grub, and meadows and pastures were much damaged by them; but the next season they had disappeared. The grub is a great eater and a poor traveler. Where they are sufficiently numerous to eat out all the grass-roots, they die for want of food soon after this is done.

The fruit of this county was killed by the late frosts, so that we had but little, except where there were grapes. The rambo apple appears to stand frosts and other hardships better than any other kind. One orchard, in the northern part of this county, belonging to William Hamilton, had in it more than twenty large rambo trees, all loaded with apples.

There were no entries for premiums on crops, except one of potatoes by E. Bawhan, who raised 80 bushels on a fourth of an acre. The same ground had been in potatoes for some twelve years, and manured every second or third year with stable manure, at the rate of twenty loads to the acre.

## WARREN COUNTY.

In presenting the Eleventh Annual Report of the Warren County Agricultural Society, the Board reports that, after holding several meetings, and consulting with agriculturists and other citizens from different parts of the county, it was concluded that the cause of agriculture would not be promoted by holding a Fair this year. The reasons were the low price of produce, the unsettled state of the public mind, with a disposition to congregate where the latest news was to be had, there to discuss the affairs of the country, to the neglect of that strict devotion to the perfection of the products of agriculture and care of domestic animals which are essential to a good and useful exhibition. Hence no Fair was held.

LIVE STOCK.—There has been no material change in the live stock of the county differing from former reports. A new market has, however, been opened for horses for government use, and a large number have been furnished from this county. Horses and hogs continue to receive that special attention which this county has hitherto devoted to them.

FIELD CROPS.—The wheat crop of the county will fall below an average—not above eight or ten bushels per acre. Corn is an average crop—about forty bushels. Barley is light. Oats are good. Hay is better than usual—about one and a half ton. Potatoes are good; some complaint of the rot.

FRUIT—Of all descriptions, except apples, was a good crop. Peaches, especially, were abundant. About forty-five thousand bushels of this fruit were marketed, at an average clear profit of one dollar and fifty cents per bushel to the producers. They were shipped by railroad, mostly to towns north, many to Cincinnati, and some to Detroit, Buffalo, and Rochester.

SORGHUM—Was more generally raised than in previous years, mostly in small quantities. The amount of manufactured molasses is estimated at from thirty to forty thousand gallons. The improved facilities for manufacturing have produced a corresponding improvement in the article. It is now selling in our market at 50 cents per gallon.

The Society has thirty acres, well improved, which cost about $175 per acre, and the improvements about $3,000. The amount due on the land is $420, which is all of the indebtedness of the Society.

## WASHINGTON COUNTY.

In the month of April we adopted a Premium List and appointed a time for the Annual Fair, although it was doubtful if one could be successfully held, owing to the excitement, particularly along the southern border of the State. Our Fair Ground was soon after taken possession of by the State, and Camp Putnam located upon it. It has been so held since, and consequently we have had no Fair.

Number of members, 50.

The wheat crop, largely "weevil-proof," is above an average, and nearly all trials of it have proved very satisfactory. Of corn, grass, and potatoes, a large yield. Fruit almost a total failure. Increased attention paid to sorghum. Probably we have made near ten thousand gallons of molasses. We hear of considerable injury to corn, potatoes, and meadows, by a grub-worm.

Our annual meeting was held October 22d.

## WAYNE COUNTY.

The Twelfth Annual Fair of the Wayne County Agricultural Society was held on the grounds of the Society, near Wooster, October 1st, 2d, and 3d, 1861. The exhibition this season, although some of the departments were not so fully represented as last year, proved to be an entire success. The number of persons in attendance was larger than usual, evincing an unabated interest in our people for the various industrial pursuits.

The small sum of $150 will place this Society out of debt, and possessed of real estate worth not less than $3,000. The healthy condition of the finances of the Society will enable the present Boord of Managers to hold out further encouragement in the way of additional and increased premiums next fall.

## WILLIAMS COUNTY.

The Sixth Annual Fair of the Williams County Agricultural Society was held at Bryan, on the 2d, 3d, and 4th days of October, 1861.

The proceedings of the Society for the last year have been similar to those of like societies. Its proceedings have been useful in advancing the agricultural, grazing, stock-raising, and mechanical interests of the county, and, if properly managed, as heretofore, will continue to do so. It has 253 members.

The principal crops raised in the county for the last year are as follows:

WHEAT.—A medium crop, and not much injured by insects; average about 15 bushels per acre.

CORN.—A very good crop in yield and quality, and will average about 35 bushels per acre.

GRASS.—About medium; average about 1¼ ton per acre.

FRUIT.—Almost a failure.

OATS.—Not much raised, and not an average.

BARLEY.—Ditto.

SUGAR-CANE.—Not much raised this year, and was a decided success, both in kind and quality, and will be largely increased the next year.

Other grains and seeds about an average.

Our county being comparatively new, and the farmers having to contend with stumps, roots, and limited means, have not been able to develop their crops, but are making good progress towards the same.

# ESSAYS.

## COMPOSITION OF GRAINS, VEGETABLES, AND FRUITS.

BY J. H. SALISBURY, M. D.

The following tables are taken from a work in progress, On the Composition of Grains, Grasses, Vegetables, and Fruits, and the Insects and Fungi injurious to them. I hope soon to have the pleasure of offering this work to those interested in the advancement of the art of agriculture. The object of the work is to bring together, in a concise form, matter valuable to the agriculturist, which is scattered widely, and mingled with much valueless material. Much of the work will be made up of matter inaccessible to those it would perhaps the most interest and the most profit.

All of the analyses, not credited to others, have been made by myself.

### COMPOSITION OF GRAINS.

### CORN.

Table I.—*Per centage of Water, Organic and Inorganic Matter.*

| | Large Ohio Yellow Dent. | Large Va. White Flint. | Tuscarora or Turkey Wheat Corn. | Rhode Island Sweet Corn. |
|---|---|---|---|---|
| Per centage of water | 10.46 | 10.16 | 17.22 | 13.66 |
| " organic matter | 87.98 | 88.26 | 81.26 | 84.08 |
| " inorganic matter | 1.56 | 1.38 | 1.52 | 2.26 |

Table II.—*Amount of the several Inorganic and Proximate Organic Bodies in 1,000 pounds of the Grain in each of the following varieties.*

| | Large Ohio Yellow Dent. | Large Va. White Flint. | Tuscarora or Turkey Wheat Corn. | Rhode Island Sweet Corn. |
|---|---|---|---|---|
| Phosphoric acid<br>Peroxide of iron | 6.3162 | 6.3154 | 6.8586 | 10.176 |
| Potassa | 3.3503 | 3.1962 | 2.2045 | 2.966 |
| Soda | 2.7961 | 3.1042 | 3.2029 | 5.301 |
| Magnesia | 2.3471 | 2.5317 | 1.9670 | 2.954 |
| Lime | .0906 | .0875 | .0509 | .076 |
| Sulphuric acid | .1846 | .1759 | .1938 | .125 |
| Chlorine | .0920 | .0843 | .0684 | .061 |
| Silicic acid | .2631 | .2375 | .1178 | .256 |
| Loss | .1600 | .1903 | .5361 | .684 |
| Amount of inorganic matter in 1,000 lbs of grain | 15.8 lbs. | 15.6 lbs. | 15.2 lbs. | 22.6 lbs. |

### TABLE II.—*Continued.*

| | Large Ohio Yellow Dent | Large Va. White Flint. | Tuscarora or Turkey Wheat Corn. | Rhode Island Sweet Corn. |
|---|---|---|---|---|
| Starch | 540.0 | 340.4 | 469 2 | 151.6 |
| Dextrine | 53 6 | 52 8 | 36 8 | 123 2 |
| Sugar and extract | 68.0 | 118 0 | 88.0 | 208.0 |
| Zein (gluten of corn) | 45.6 | 59.6 | 44 8 | 36 8 |
| Oil | 39.0 | 46 0 | 46 0 | 99 2 |
| Albumen | 30.0 | 82 6 | 78 6 | 130 0 |
| Casein | 10.4 | 12 8 | 1 6 | 26.4 |
| Cellulose and lignin | 94.8 | 107.6 | 108.0 | 128.0 |
| Matter obtained from cellulose and lignin by sol. potassa | 6.8 | 69 4 | 1.2 | 2 4 |
| Amount of proximate organic bodies in 1,000 lbs. grain | 898 8 lbs | 889 2 lbs | 864 2 lbs. | 905 6 lbs. |
| Subtract the inorganic matter | 15 8 | 15.6 | 12 2 | 22 6 |
| | 883 lbs. | 873.6 lbs | 843 lbs. | 883 lbs. |
| Amount of water in 1,000 lbs. of grain. | 103.6 lbs. | 103.6 lbs. | 122 2 lbs. | 102.2 lbs. |
| | 986.6 lbs. | 976.2 lbs. | 971.2 lbs. | 985 2 lbs. |
| Loss in analyzing | 13.4 | 23.8 | 28.8 | 14 8 |
| Total | 1.000 lbs. | 1,000 lbs. | 1,000 lbs. | 1,000 lbs. |

## WHEAT.*

### TABLE III.—*Per centage of Water, Organic and Inorganic Matter, in the following varieties.*

| | Wheat. (Way. Eng.) | White Winter Wheat. | Dark Winter Wheat. |
|---|---|---|---|
| Per centage of water | .... | 9 58 | 9.87 |
| " organic matter | .... | 88.76 | 88.30 |
| " inorganic matter | 1 69 | 1.66 | 1.83 |

### TABLE IV.—*Composition of the Inorganic Matter of three varieties.*

| | Wheat. (Way. Eng ) | White Winter Wheat. | Dark Winter Wheat. |
|---|---|---|---|
| Phosphoric acid | 45.01 | 48.19 | 46 91 |
| Peroxide of iron | .82 | .67 | .99 |
| Potassa | 31 44 | 26 82 | 25.72 |
| Soda | 2.71 | 3.78 | 4 48 |
| Magnesia | 12.36 | 13.95 | 12.78 |
| Lime | 3 52 | 1 87 | 4.13 |
| Sulphuric acid | .34 | .82 | .64 |
| Carbonic acid | .02 | .09 | .06 |
| Chlorine | .13 | .26 | .17 |
| Silicic acid | 3.67 | 3.51 | 3.91 |
| | 100 | 99 97 | 99.79 |

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* For a full and interesting history of the wheat plant, with its composition, culture, insects and fungi injurious to it, &c., see the elaborate essay, published in the Ohio Agricultural Report for 1857, by J. H. Klippart, the able Corresp. Secretary of the Ohio State Board of Agriculture.

TABLE V.—*Amount of the several Inorganic and Proximate Organic Bodies in 1,000 pounds of the Grain of the following varieties of Wheat.*

| | Wheat. (Way. Eng.) | White Wheat (Dr. Peters, Ky.) | White Wheat. Winter. | Dark Wheat. Winter. |
|---|---|---|---|---|
| Phosphoric acid | 7.6055 | 7.60 | 7.9996 | 8.5985 |
| Peroxide of iron (and manganese in Dr. Peters' analysis) | .1385 | traces. | .1113 | .1813 |
| Potassa | 5.3123 | 4.54 | 4.4632 | 4.7268 |
| Soda | .4580 | .11 | .6275 | .8199 |
| Magnesia | 2.0877 | 2.02 | 2.3268 | 2.3398 |
| Lime | .5943 | 1.36 | .3104 | .7578 |
| Sulphuric acid | .0575 | .07 | .1114 | .1171 |
| Carbonic acid (and loss in Dr. Peters' analysis) | .0034 | .81 | .0149 | .0111 |
| Chlorine | .0220 | .29 | .0422 | .0311 |
| Silicic acid | .6202 | .34 | .5927 | .7166 |
| Amount of inorganic matter in 1,000 lbs. of grain | 16.9 lbs | 17.14 lbs. | 16.6 lbs. | 18.3 lbs. |
| Starch | .... | .... | 553.3 | 535.0 |
| Gluten | .... | .... | 171.6 | 164.7 |
| Albumen | .... | .... | 14.2 | 11.3 |
| Casein | .... | .... | trace. | trace. |
| Oil | .... | .... | 10.7 | 11.9 |
| Dextrine or gum | .... | .... | 10.3 | 13.7 |
| Sugar | .... | .... | 20.1 | 19.3 |
| Cellulose and lignin | .... | .... | 71.1 | 76.9 |
| Matter dissolved from cellulose and lignin by a weak solution of potassa | .... | .... | 34.3 | 50.2 |
| Amount of organic matter in 1,000 lbs. of grain | .... | .... | 887.6 lbs. | 883 lbs. |
| Amount of water in 1,000 lbs. of grain | .... | .... | 95.8 lbs | 98.7 lbs. |
| Total | .... | .... | 1,000 lbs. | 1,000 lbs. |

TABLE VI.—*Composition of the grain of Rye, Barley, Oats and Buckwheat. Per centage of Water, Organic and Inorganic Matter.*

| | Rye grain. | Barley grain. | Oat grain (Norton). | Buckwheat grain. |
|---|---|---|---|---|
| Per centage of water | 10.20 | 10.48 | 12.21 | 12.88 |
| Per centage of organic matter | 88.75 | 87.18 | 85.59 | 83.52 |
| Per centage of inorganic matter | 1.05 | 2.34* | 2.20 | 3.60 |

* This is the mean of 10 experiments, by Prof. Horsford of Cambridge.

**Table VII.**—*Amount of the several Inorganic and Proximate Organic Bodies in 1,000 lbs. of each of the following varieties of Grain.*

| | Rye grain. | Barley grain. | Oat grain (Norton). | Buckwheat grain. |
|---|---|---|---|---|
| Phosphoric acid | 5 340 | 8 6112 | 10.822 | 18.19 |
| Peroxide of iron | .020 | .1942 | .194 | |
| Potassa | 1.2[illegible]0 | 3 7440 | 6.974 | 7.76 |
| Soda | 1·963 | 2.0733 | | .86 |
| Magnesia | 1.110 | 1.0062 | 1.912 | 5.67 |
| Lime | .740 | .7558 | 1.170 | 1.11 |
| Sulphuric acid | .054 | .0374 | ...... | 0.57 |
| Carbonic acid | trace. | ...... | ...... | ...... |
| Cholrine | trace. | .0351 | .046 | .12 |
| Silicic acid | .073 | 6 9.29 | .411 | .72 |
| Loss | ...... | ...... | .471 | 1.00 |
| Amount of inorganic matter in 1,000 lbs. of grain | 10 5 lbs. | 23.4 lbs.* | 22 lbs. | 36 lbs. |
| Starch | 406.261 | 590.844† | 554.538 | 415.50 |
| Gluten | 68.749 | 48.049 | 21.141 | 26.00 |
| Albumen | 22 698 | 3.418 | 3.937 | 164.20 |
| Casein (or avenine in the oat) | trace. | ...... | 134.890 | 7.80 |
| Oil | 12.989 | 3.418 | 46.541 | 4 70 |
| Dextrine | 79.310 | 44.045 | 17.974 | 16.00 |
| Sugar | 21.648 | 45.509 | 38.601 | 60 10 |
| Cellulose and lignin | 44.345 | 112 895 | 9.100 | 140.90 |
| Soluble phosphates, &c. | ...... | 3 516‡ | ...... | ...... |
| Loss | ...... | 22.559 | 29.178 | ...... |
| Amount of dry flour in 1,000 lbs grain | 656 lbs. | 874.253§ | 855.9 lbs. | 835.2 lbs. |
| Amount of dry bran in 1,000 lbs. grain | 242 lbs. | | ...... | ...... |
| Amount of water in 1,000 lbs. grain | 102 lbs. | 102.3471bs | 122.1 lbs. | 128.8 lbs. |
| Total | 1,000 lbs. | 1,000 lbs. | 1,000 lbs. | 1,000 lbs. |

* Calculated from an inorganic analysis made by Dr. Thompson.

† Calculated from a proximate organic analysis made by Hermbstadt.

‡ Proust divides the starch of barley into starch and a body which he calls *hordein*. Gregory gives the composition of hordein as $C_{12}H_{10}O_{10}$. Barley contains over 50 per cent of what Proust calls hordein. Hordein is woody insoluble in water, both cold and boiling. Changes into gum and oxygen during malting, and into alcohol by fermentation. Many regard it as a peculiar substance, while others consider it merely a modified form of starch.

§ This should be regarded mostly as loss.

**Table VIII**—*Composition of the grain of Millet, Beans and Peas. Per centage of Water, Organic and Inorganic Matter.*

| | Millet grain. | Kidney bean. | Peas. |
|---|---|---|---|
| Per centage of water | 10.728 | 23.000 | 12.5 |
| Per centage of organic matter | 85 872 | 74 864 | 85 036 |
| Per centage of inorganic matter | 3.4 | 2 136 | 2 464 |

**TABLE IX**—*Amount of the several Inorganic and Proximate Organic Bodies in 1,000 lbs. of each of the following varieties of Grain.*

| | Millet grain. | Kidney bean.* | Peas † |
|---|---|---|---|
| Phosphoric acid | 12.19 | 2.92 | 1 90 |
| Peroxide of iron | | | .10 |
| Potassa | 2 53 | 4.15 | 8.10 |
| Soda | 2.91 | 8.16 | 7.39 |
| Magnesia | ...... | 1.58 | 1.36 |
| Lime | ...... | 1.65 | .58 |
| Sulphuric acid | trace. | .89 | .53 |
| Chlorine | trace. | .41 | .38 |
| Alumina | ...... | .34 | .20 |
| Silicic acid | 15.63 | 1 26 | 4.10 |
| Loss | 0.52 | ...... | ...... |
| Amount of inorganic matter in 1,000 lbs. of grain | 34 lbs. | 21.36 lbs. | 24.64 lbs. |
| Starch | 337 30 | 418.87 | 421.674 |
| Gluten | 40.40 | ...... | ...... |
| Albumen (Legumen of beans and peas) | 80.24 | 229.68 | 255.787 |
| Casein | 46.65 | ...... | ...... |
| Oil | 20.00 | 6.90 | 11,824 |
| Dextrine or gum | 40.80 | 14 33 | 39.475 |
| Sugar | 98.68 | .20 | 19 650 |
| Cellulose and lignin | 195.65 | 68 66 | 81.950 |
| Loss | ...... | 10.00 | 19.800 |
| Amount of organic matter in 1,000 lbs of grain | 858 72 lbs. | 748.64 lbs | 850.36 lbs. |
| Amount of water in 1,000 lbs. of grain | 107.28 lbs | 230 lbs. | 125 lbs. |
| Total | 1,000 lbs. | 1,000 lbs. | 1,000 lbs. |

* Calculated from analyses, by Braconnot and Einhof.
† Calculated from analyses, by Emmons.

## VEGETABLES.

**TABLE X.**—*Composition of the Potato, Sweet Potato, and Artichoke. Per centage of Water, Organic and Inorganic Matter.*

| | Red Artichoke. | White Artichoke. | Irish Potato.* | Mercer Potato. | Sweet Potato. |
|---|---|---|---|---|---|
| Per centage of water | 68.35 | 83.607 | 73.120 | 79.109 | 64.172 |
| Per centage of organic matter | 30.298 | 15.619 | 26 262 | 20.312 | 34.738 |
| Per centage of inorganic matter | 1.352 | .774 | .618 | .579 | 1.090 |

* Inorganic analysis by Prof. Hardy, organic by Henry. Variety not given.

TABLE XI.—*Amount of the several Inorganic and Proximate Organic Bodies in 1,000 lbs. of each of the following varieties.*

| | Red Artichoke. | White Artichoke. | Irish Potato. | Mercer Potato. | Sweet Potato. |
|---|---|---|---|---|---|
| Phosphoric acid........ | 1.629 | .771 | .773 | 1.395 | 1 701 |
| Peroxide of iron and Alumina................ | .169 | .093 | .062 | ...... | ...... |
| Potassa ................ | 5.902 | 3 267 | 3.245 | .780 | 6.312 |
| Soda.................. | .893 | 1.181 | .031 | 1.716 | .640 |
| Magnesia.............. | .041 | .043 | .278 | .743 | .803 |
| Lime ................. | .453 | .151 | .124 | .112 | .504 |
| Sulphuric acid ......... | .602 | .151 | .433 | .360 | .160 |
| Carbonic acid.......... | 3.123 | 1.694 | .773 | ...... | ...... |
| Chlorine .............. | .358 | .199 | ...... | 404 | .540 |
| Silicic acid............ | .182 | .124 | .421 | .280 | .240 |
| Loss ................ | .161 | .066 | .040 | ...... | ...... |
| Amount of inorganic matter in 1,000 lbs of tubers ................ | 13.52 lbs. | 7.74 lbs | 6.18 lbs. | 5.76 lbs. | 10 9 lbs. |
| Starch ................ | 58.84 | 28.50 | 129 082* | 96 50 | 184 23 |
| Gluten ................ | 1.22 | 96 | 9.012 | 2.05 | ...... |
| Albumen.............. | 40 86 | 20 80 | | 2 49 | 73 87 |
| Resin ................ | 1 84 | 1.68 | ...... | ...... | 2.07 |
| Casein ............... | 44.00 | 20 52 | ...... | 4 68 | 9.70 |
| Oil and fat ............ | .18 | .24 | 11.012 | .84 | ...... |
| Dextrine and gum ..... | 54 36 | 26 52 | .. | 12 63 | 6.93 |
| Sugar................. | 76 88 | 39 52 | 32.434 | 26.34 | 53 49 |
| Cellulose and lignin... | 36.76 | 22.52 | 66.769 | 57.59 | 17 09 |
| Volatile poisonous matter†.. .... ......... | ...... | ...... | .499 | ...... | ...... |
| Salts‡................ | ...... | ...... | 13 812 | ...... | ...... |
| Amount of inorganic matter in 1,000 lbs of tubers .......... | 302.98 lbs. | 056.19 lbs. | 262 62 lbs. | 203 12 lbs. | 347.38 lbs. |
| Amount of water in 1,000 lbs. of tubers ........ | 683.5 lbs. | 836.07 lbs. | 731.2 lbs. | 791.09 lbs. | 641.72 lbs. |
| Total............. | 1,000 lbs. | 1 000 lbs. | 1,000 lbs. | 1.000 lbs. | 1,000 lbs. |

* Inorganic analysis by Prof Hardy, organic by Henry. Variety not given.

† This volatile poisonous matter was obtained by Henry. Probably the potato was taken during the period of sprouting.

‡ This with more probability might be set down mainly as loss. The amount of uncombined salts in the juices of the potato are very small. Payen and Persoz found diastase in the neighborhood of the bud, and Otto discovered solanin in the bud itself. To the presence of the latter is attributed the ill effects from the use of germinated potatoes as food.

TABLE XII.—*Composition of the Turnip, Blood and Sugar Beets, Carrot, and Parsnip. Per centage of Water, Organic and Inorganic Matter.*

| | Turnip Beet. | Blood Beet. | White Sugar Beet. | Carrot | Parsnip. |
|---|---|---|---|---|---|
| Per centage of water............. | 92.855 | 89 095 | 90 55 | 87 78 | 81.312 |
| Per centage of organic matter ...... | 6 042 | 9 825 | 8 455 | 12.96 | 17 408 |
| Per centage of inorganic matter.... | 1.113 | 1 080 | .995 | 1 26 | 1.28 |

**Table XIII.**—*Amount of the several Inorganic and Proximate Organic Bodies in 1,000 lbs. of the fresh Roots of the following Plants.*

| | Turnip Beet. | Blood Beet. | White Sugar Beet. | Carrot. | Parsnip. |
|---|---|---|---|---|---|
| | lbs. | lbs. | lbs. | lbs. | lbs. |
| Phosphoric acid | 1.174 | 1.064 | 953 | 1.329 | 1.932 |
| Peroxide of iron | .211 | .124 | .123 | .088 | .083 |
| Potassa | 896 | 1.415 | 1.292 | 1 071 | 1 082 |
| Soda | 4 710 | 5.794 | 5 412 | 5 072 | 4.890 |
| Magnesia | .195 | .124 | .113 | .202 | .205 |
| Lime | .979 | .162 | .152 | .460 | .429 |
| Sulphuric acid | .211 | .178 | .157 | .542 | 1.146 |
| Carbonic acid | 2 435 | 1.757 | 1.657 | 3.553 | 2.797 |
| Chlorine | .089 | 088 | .077 | .076 | .077 |
| Silicic acid | .128 | .094 | .084 | .082 | .058 |
| Loss | .002 | .002 | .... | .125 | .100 |
| Amount of inorganic matter in 1,000 lbs. of roots | 11 13 | 10.8 | 9 95 | 12.6 | 12.8 |
| Starch | 1.95 | 2.772 | .... | 4.04 | 13.45 |
| Gluten | .33 | .178 | .12 | .55 | .40 |
| Albumen | 4.45 | 10.257 | 3.97 | 7.77 | 8.85 |
| Casein | 1.42 | .356 | 5.26 | 1 94 | 1.50 |
| Coloring matter | .27 | .151 | .... | 40 | .20 |
| Resin | .80 | .507 | .16 | 1.56 | .95 |
| Oil and fat | .10 | trace. | .08 | .10 | .23 |
| Dextrine or gum | 8.39 | 9.059 | 3 94 | 14.11 | 20 75 |
| Sugar | 25 14 | 54.358 | 50.75 | 62 96 | 80.00 |
| Cellulose and lignin | 17.57 | 20.504 | 20.27 | 35.97 | 47.75 |
| Amount of organic matter in 1,000 lbs. of roots | 60 42 | 98.25 | 84 55 | 129.6 | 174 08 |
| Amount of water in 1,000 lbs. roots | 928.45 | 890.95 | 905 5 | 857 8 | 813.12 |
| Total | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 |

The roots from which the above analyses were made were all mature, large, and of excellent quality.

**Table XIV.**—*Composition of the Cabbage, Vegetable Oyster, Rhubarb, Celery, and Endive. Per centage of Water, Organic and Inorganic Matter.*

| | Cabbage. Drum Head or Scotch Strasburg. | Vegetable Oyster. | Rhubarb Petioles. | Celery Petioles. | Endive Petioles. |
|---|---|---|---|---|---|
| Per centage of water | 83.42 | 81.22 | 93.1165 | 88 225 | 91.925 |
| Per centage of organic matter | 15.895 | 17.315 | 5.595 | 10.400 | 7.065 |
| Per centage of inorganic matter | .790 | 1.465 | 940 | 1.375 | 1.010 |

TABLE XV.—*Amount of the several Inorganic and Proximate Organic Bodies in 1,000 lbs. of the following Vegetables.*

| | Cabbage. Drum Head or Scotch Strasburg. | Root of Vegetable Oyster. | Rhubarb Petioles. (Pie Plant.) | Celery Petioles. | Endive Petioles. |
|---|---|---|---|---|---|
| | lbs. | lbs | lbs. | lbs. | lbs. |
| Phosphoric acid | 1.0385 | 2.296 | 2.113 | .743 | 1.0065 |
| Peroxide of iron | .1005 | .271 | | .681 | .2983 |
| Potassa | 2.4180 | .860 | .768 | 1.086 | .9039 |
| Soda | 2.7600 | 5.763 | 3.159 | 3.970 | 2.8305 |
| Magnesia | .3050 | .110 | .267 | .124 | .3695 |
| Lime | .2485 | .734 | .592 | 1.887 | .8182 |
| Sulphuric acid | .9115 | .571 | 1.134 | 1.436 | .2117 |
| Carbonic acid | .... | 3.604 | .984 | 2.560 | 1.4030 |
| Chlorine | .0680 | .353 | .232 | .193 | .1434 |
| Silicic acid | .0550 | .088 | .131 | .770 | 2.1150 |
| Amount of inorganic matter in 1,000 lbs | 7.9 | 14.65 | 9.4 | 13.75 | 10.1 |
| Starch | .... | .63 | .... | .... | .... |
| Gluten | .... | .25 | .... | .95 | .55 |
| Albumen | 17.181 | 19.65 | 1.178 | 13.22 | 11.50 |
| Casein | 3.558 | 3.11 | .652 | 1.15 | .70 |
| Oil | .... | .... | .... | .75 | .... |
| Dextrine and gum | 10.781 | 26.63 | 2.391 | 7.65 | 6.25 |
| Sugar and extractive matter | 86.003 | 67.47 | 13.700 | 50.25 | 36.70 |
| Resin | .... | 3.22 | .... | 1.85 | 2.40 |
| Wax | 1.584 | .... | .... | .45 | .55 |
| Chlorophyl | .911 | .... | .717 | .55 | .52 |
| Cellulose and lignin | 29.711 | 44.80 | 22.184 | 27.18 | 11.48 |
| A body which gives the plant its peculiar flavor | .482 | .73 | .... | .... | .... |
| Malic acid, with a little tartaric and oxalic acids | .... | .... | 15.126 | .... | .... |
| Matter dissolved out of cellulose and lignin by sol. potassa | 8.689 | .... | .... | .... | .... |
| Amount of organic matter in 1,000 lbs | 158.9 | 173.15 | 55.95 | 104 | 70.65 |
| Amount of water in 1,000 lbs | 834.2 | 812.2 | 934.65 | 882.25 | 919.28 |
| Total | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 |

The plants from which the above analyses were made were large, of fine quality, and in the condition when they were best suited for table use. The rhubarb was the giant variety, and was cut June 1st. The sample of celery analyzed was large, succulent, crisp, and finely flavored. Average length of tops, 3 feet; diameter of stalks at base, 3 inches; average weight of each plant, 10 ounces. The sample of endive was also large, succulent, crisp, and finely flavored. Average length of tops, 11 inches; average weight of each plant, 6 ounces. The specimens of vegetable oyster examined were large and tender, and of good quality. The average widest diameter of roots of six specimens was 1½ inches; average length, 11 inches; average length of tops, 26 inches; average weight of each root, 4 ounces; average weight of tops of each plant, 1½ ounces. The sample of cabbage examined was a large, fine specimen, weighing 18 pounds. The portion taken for analysis was a section from the center of the head to the circumference,

## FRUITS.

TABLE XVI.—*Composition of Muskmelon, Watermelon, Cucumber, Tomato, Fruit of Egg Plant, and Pods of the Okra. Per centage of Water, Organic and Inorganic Matter.*

| | Muskmel-on. Nutmeg | Watermel-on. Long Red Flesh. | Cucumber. Long Prickly. | Tomato, Large Red. | Fruit of Egg Plant Oval Purple. | Pods of Okra. |
|---|---|---|---|---|---|---|
| Per centage of water... | 90.987 | 94.898 | 95.424 | 94.758 | 91.353 | 88.11 |
| Per centage of organic matter...... ...... | 8.742 | 4.854 | 4.288 | 4 908 | 8.043 | 10.961 |
| Per centage of inorganic matter.... ......... | 2.71 | .248 | .288 | .334 | .604 | .739 |

TABLE XVII.—*Amount of the several Inorganic and Proximate Organic Bodies in 1,000 lbs. of the following Fruits.*

| | Muskmel-on. Nutmeg. | Watermel-on. Long Red Flesh. | Cucumber. Long Prickly. | Tomato. Large Red. | Fruit of Egg Plant. | Pods of Okra. |
|---|---|---|---|---|---|---|
| | lbs. | lbs. | lbs. | lbs. | lbs. | lbs. |
| Phosphoric acid........ | .7285 | .4804 | .6094 | 8.663 | 1.7516 | .... |
| Peroxide of iron ....... | .0225 | .0122 | .0243 | | | |
| Potassa............... | .2274 | .6040 | .6794 | .7226 | 1.1684 | .... |
| Soda.................. | .9329 | .7698 | .9749 | .9936 | 1.9518 | .... |
| Magnesia ............. | .0174 | .0327 | .0052 | .0539 | .0828 | .... |
| Lime.................. | .1599 | .1819 | .1239 | .0026 | .0046 | .... |
| Sulphuric acid........ | .1068 | .0406 | .0263 | .0602 | .2864 | .... |
| Carbonic acid.......... | .3141 | .2844 | .3846 | .3570 | .2853 | .... |
| Chlorine .............. | .1409 | .0449 | .0318 | .1434 | .1062 | .... |
| Silicic acid........... | .0597 | .0301 | .0202 | .1402 | .1029 | .... |
| Amount of inorganic matter in 1,000 lbs....... | 2.71 | 2.48 | 2.28 | 3.34 | 6.04 | 7.39 |
| Starch ................ | trace. | trace. | .02 | .... | 5.12 | .... |
| Gluten................. | .... | .... | .... | .... | .... | .... |
| Albumen.............. | 8.96 | 5.48 | 3.32 | 1 87 | 4 68 | .... |
| Casein ................ | 4 32 | .04 | .36 | 1.84 | 2.76 | .... |
| Dextrine .............. | 11.12 | 3.07 | 3.30 | 4 90 | 4.89 | .... |
| Sugar and extract (with a bitter principle in the egg plant)........... | 51.35 | 29.26 | 26.56 | 26.30 | 40.86 | .... |
| Cellulose and lignin.... | 10.93 | 10.25 | 8 99 | 10.90 | 22.00 | 37.91 |
| Coloring matter ........ | .04 | .06 | .06 | .07 | .07 | ... |
| Fatty matter........... | .38 | .22 | .27 | .... | .05 | .... |
| Wax .................. | | | | | | |
| Resin ................ | | | | | | |
| Citric acid ............ | trace. | .07 | .... | | | |
| Malic acid ............ | .07 | .09 | | 3.20 | .... | .... |
| Tartaric acid .......... | .05 | trace. | | | | |
| Mucilage, with a little albumen, casein, gum, sugar, and extract.... | .... | .... | .... | .... | .... | 71.70 |
| Amount of organic matter in 1,000 lbs....... | 87.42 | 48.54 | 42.28 | 49.08 | 80.43 | 109.61 |
| Amount of water in 1,000 lbs. ............... | 909.87 | 948 98 | 954.24 | 947.58 | 913,53 | 831.1 |
| Total ................. | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 |

The muskmelons examined were fine specimens of the "nutmeg" variety, in prime condition for eating. The watermelons were the "long red flesh" variety; they were fine, large specimens, in excellent eating condition. The cucumbers were the "long prickly." Average length of those examined, 6½ inches; average diameter, 1¾ inches. They were in good condition for table use, being fine and crisp. The tomatoes were a very fine seedling (very large) from the "large red" variety. They were grown and furnished by Mr. Rathbone, of Kenwood, Albany. The fruit of the egg plant was a fine, large specimen of the "oval-shaped purple." It was also grown and furnished by Mr. Rathbone, of Kenwood. The pods of the okra were tender, and in a fine state for cooking. They were from a large, thrifty plant grown by Mr. Rathbone.

TABLE XVIII.—*Proximate Organic Analyses of the Apple, Pear, Peach, Cherry, and Gooseberry, calculated on* 1,000 *lbs. of the fresh Fruit.*

| | APPLE. | | Pear. | Peach. | Cherry. | Gooseberry. |
|---|---|---|---|---|---|---|
| | Talman Sweeting. | Swaar. | | | | |
| | lbs. | lbs. | lbs. | lbs. | lbs. | lbs. |
| Dextrine | 30.12 | 29.38 | 31.70 | 51.20 | 32.30 | 7.80 |
| Sugar and extractive matter | 102 91 | 83.17 | 64.50 | 164.80 | 181.20 | 62.40 |
| Malic acid | 2.60 | 3.91 | 1.10 | 18.00 | 20.10 | 24.10 |
| Citric acid | .... | .... | .... | .... | .... | 3.10 |
| Tartaric acid | .... | .... | .... | .... | .... | .... |
| Coloring matter | .60 | .34 | .80 | 11.00 | .90 | 2.90 |
| Albumen | 9·33 | 13 47 | .80 | 1.70 | 5.70 | 8.60 |
| Casein | .93 | 2.02 | .... | .... | .... | .... |
| Glutinous matter, with a little fat and wax | 3 06 | 1.21 | .... | .... | .... | .... |
| Cellulose and lignin | 35.25 | 19.00 | 38.30 | 18.60 | 11.30 | 80.10 |
| Dry matter in 1,000 lbs. of fruit | 184.8 | 152.5 | 137.2 | 265.3 | 251.5 | 189 |
| Water in 1,000 lbs. fruit | 815 2 | 847.5 | 862.8 | 734.7 | 748.5 | 811 |
| Total | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 |

The cherry, peach, pear, and gooseberry were analyzed by M. Berard.

# PLANTS—PHYSIOLOGICAL OBSERVATIONS.

It is not without the bounds of possibility to suppose that there is another agent which is concerned in the growth of plants, aside from light and heat, and which is like them imponderable. Indeed, various phenomena of vegetation would seem to indicate such an agent, but whether it has origin in the earth or atmosphere, is, with our present knowledge, not to be determined. The following facts, however, seem to corroborate this theory.

1. If plants grow undisturbed from the seed, they will present a pyramidal form, caused by the main shoot being prolonged as the axis of the plant, while other branches complete the figure. This form many plants retain through life; others, after having arrived at a certain age, spread out at the crown, while the pear tree, which, if suffered to grow undisturbed, will seldom shoot out sprigs from the trunk, if bent to the north will send out numerous shoots from the bend, and if these are cut off, new shoots arise from the old trunk, and these being removed, the tree dies.

2. Hedges which are frequently trimmed do not spread much sideways, but shoot up long and strong branches. This is especially true of hawthorn and fir, and if these shoots are allowed to remain, every one will become a pyramid shaped tree; the lower branches die, and the hedge dies also.

3. If the perpendicular branch or axis of a fir (abies) be removed in summer, then one of the horizontal branches will become perpendicular, and take the place of the one removed.

4. When the Coniferæ grow up densely from the seeds, some soon become higher than others. As soon as this inequality becomes apparent, the smaller ones standing near are seen to die. This process goes on until the forest reaches its growth, hundreds dying where one that attains its full growth. This will take place not only when the larger tree overshadows the smaller, but when it has grown higher, as though the larger tree drew from the atmosphere by at raction something necessary for the life of the others. This fact has given origin to the so-called *searching system*, by which the *smaller* trees are removed, both for use and to give more room and nourishment to the larger ones.

5. Where forests spring up naturally, from the seeds of fir, pine, beech, and other trees, driven before the wind and deposited upon level plains and burnt tracts of land, each tree has an axis which is but the prolongation of the primary stalk. This axis grows to the utmost height attained by that species of tree. After the tree has reached its greatest height, other branches are more developed,

forming a dense crown. After this the tree increases in bulk only. Small branches spring out, which attain a greater size than those surrounding, and those which are smaller gradually die out, until at last we have a tree of several large branches, standing at considerable intervals. During this struggle for life and ascendancy, the larger branches grow from 12 to 30 inches each year.

An exception to this general law is seen in the artificial forests of the Margraviate of Brandenburg, on the road from Kœthen to Berlin. The pine trees are planted in rows from 3 to 4 feet apart, and in these the small pine stems stand at equal distances. These small trees, as far as the eye can reach, are of an equal height, about 5 feet, similar in form, each having a dense crown, as if trimmed carefully with a hedge knife. There is no appearance of an axis rising above the crown, and the annual shoots are only one-fourth or one-half an inch in length. If, then, the age of the tree be calculated from its annual growth, they would be eighty or one hundred years or more old.

These small trees, like the oaks which are grown in China in pots, have attained their growth, and for this reason the crown is fully developed. But why have they grown old so soon? The foresters there attribute it to the soil, but as the same soil in other sections produces large and well-developed trees, we are inclined to think that it is caused by the removal of fallen leaves and moss from the ground, which otherwise would have formed a rich mould, attracting vapors from the air, and thus become a reservoir of carbonic acid.

6. A pine grove adjoins a meadow, upon the edge of which is planted willows. These do not grow perpendicularly, but incline outwards whenever overhung by pines, even at a height of 12 or 16 feet. In a park, the trees on the outside incline as soon as those behind rise from one-half to one foot above them.

7. If plants grown in pots are placed under trees with dense foliage, they will soon die, even if they have full benefit of the sunlight.

8. In a dense forest, thousands of seeds fall upon the nearly bare ground and moss, but not a seed will germinate as far as the branches of the trees reach. If the forest is cleared, leaving a few trees standing, the seed from these trees will spring up, but not under the branches of the tree.

9. When a piece of ground is full of seeds of different kinds, no more of them will germinate than can grow up and reach a perfect development. If these be removed, another crop will spring up, and so on through summer and autumn and the next season, and for two or three years, though none of the plants have been allowed to seed. This can be explained only by supposing that the seeds first germinating deprived the others for a time of their germinating power.

From this we derive the following agricultural principles:

1. If the field is not fully covered with the plants sown, weeds will spring up and occupy the empty spaces.

2. Every species of plant requires a certain amount of room to insure its full development. Therefore, a certain quantity of seed—which quantity varies with

the species—is required for a given quantity of land, in order that the ground may be well covered, and weeds cannot spring up.

For the purpose of ascertaining the proper quantity of seed to be sown, experiments have been made by an English agriculturist, upon 30 acres of ground. Oats and Barley were sown as in the following table, which also gives the yield of each:

| | Oats. | Barley. |
|---|---|---|
| ½ bushel, yielding | 7 bushels | 9 bushels. |
| 1 " " | 11 " | 20 " |
| 1½ " " | 16 " | 30 " |
| 2 " " | 19 " | 30 " |
| 2½ " " | 20 " | 45 " |
| 3 " " | 17 " | 49 " |
| 3½ " " | 12 " | 31 " |
| 4 " " | 10 " | 27 " |
| 4½ " " | 8 " | 24 " |
| 5 " " | 5½ " | 20 * " |

By this manner the proper amount of seed per acre may be determined.

The farmer very often has the following experience: he plants, for instance, 1½ bushels of good seed per acre; it comes up so densely that every seed appears to have germinated. The stools are firm and strong, of from 6 to 8 stalks each. The field is perfectly covered, so that a moderate rain or wind beats down the grain. From the appearance of the field, he anticipates a yield of from 75 to 100 bushels per acre, while in reality it yields but from 20 to 25 bushels. This indicates that a portion of the seed sown did not germinate, and the question arises, where are the remaining grains which were sown? If the roots be examined it will be seen that only a few seeds germinated, but that all those which did, stooled, and our inference is that if less seed had been planted, a larger number would have germinated.

If a dense cover is placed over seeds, as for instance a bridge over a ditch, the spot covered will be bare, and the lower the cover is the more effectually will it prevent germination.

Under large broad leaves, as of rhubarb or cabbage, the ground will remain bare, but if such leaves be removed early in the fall, the spot will soon be covered with weeds.

It has been said that climate prevents introduced plants from growing wild. This, to a certain extent, depends upon the meaning of growing wild. If those plants only are considered naturalized which have been years ago introduced into our meadows and forests, it is true that we have very few which we can consider naturalized, and these may have become so under very favorable circumstances,

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* I very much doubt whether this statement can be received as reliable; it, however, indicates the course to be pursued to ascertain the facts in the case.—Klippart

such as are above mentioned as influencing growth. But if we should consider those plants naturalized which grow spontaneously and without special cultivation in our gardens—and there is no reason why we should not—we have a great number. Many of our most common weeds have been introduced, and of flowers we have several which are not natives.

An examination into the geographical limits of some of our cereals shows that it is not upon climate that their naturalization depends. Wheat grows from the equator to the 60th degree of north latitude, and while, as a general rule, it requires certain conditions of soil and location within this limit, it is sometimes found growing in places least expected. Wheat once was found growing in the forest of the Manor of Garsden, and on asking the gardener how this happened, he replied that formerly there had been a wheat field at the edge of the forest, and that animals had dropped the seed which had sprung up.

We may fix the geographical boundary of rye as far north as it will mature in all seasons. Kotzebue found it growing wild near Ft. Ross, in North America, where it is gathered by the Indians. A correspondent writes from Oregon, that he found it on his way from California to Oregon. It is also found in the Desert of Cobi, in Middle Asia. These cereals sometimes make their appearance at a time and place altogether unexpected. The rotation of crops on some land is as follows: 1st, rye; 2d, barley; 3d, oats; 4th, potatoes; 5th, barley; 6th, oats and clover; 7th, clover. In this crop of clover, the seventh after rye, the rye always appears, and sometimes as dense as if sown with great care. The winter cereals do not grow wild, because they cannot germinate in soil covered with grass or shaded by trees; while the summer cereals do not grow wild because they cannot withstand the frosts of winter. Only once have I seen barley germinate from seed which had laid in the ground through the winter; this was in 1857.

To know why plants do not grow is of less importance than to ascertain under what circumstances they may become naturalized.

Experience has shown that in many instances plants may become naturalised by accelerating their development.

1. Barley, which in Germany requires from fourteen to fifteen weeks for its full development, attains its maturity in Lapland in from six to seven weeks.

2. Potatoes, the late kinds of which require five months to reach a full development, have, according to Leopold von Buch, not failed in five years in Lyngen, two degrees beyond the Polar Circle—thus attaining their full development in little less than three months. This development is probably accelerated by the long continued presence of light.

3. By a judicious selection and cultivation from seed, we have succeeded in creating a variety of potatoes which mature in August, thus requiring but four months to perfect themselves.

4. Among pears and apples grown from seed, many ripen earlier and some later than those on the parent tree, while at the same time the trees on which they grow are more or less hardy.

It is remarkable that this development depends upon a more rapid development, and not in the plants becoming more hardy against frost.

Plants imported from foreign countries are sometimes more hardy than those grown here from seed.

The sweet cherries introduced from Asia Minor are not injured by frost, as is the case also with the elder from the same country.

The artichoke (helianthus tuberosus) is said to have been imported from Brazil, but its leaves are not easily killed by frost, and its tubers withstand the hardest winters.

A Peruvian plant, Chenapodium Guinea, withstood a severe frost uninjured, which killed many garden vegetables.

The Bergamont pears, introduced into Europe by Lucullus, can stand uninjured our severe winters, bu the Josephine pears grown from seed are easily killed, as is the case with the Napoleon pear.

This hardihood is not acquired by acclimatization, but it is a natural property of the plant, and one which will be retained if it is raised for a long series of years from the seed, as has been proven in many instances.

# INFLUENCES ACTING ON VEGETABLE RACES TO MODIFY THEIR CHEMICAL COMPOSITION.

The influence which the climate, exposition, isolation, nature of the soil, and cultivation exercise on the vegetable species, is manifested by a "variation, more or less," in certain organic or inorganic principles, which are peculiar to that species; but this variation is never so great as to cause those principles to disappear entirely, or to create others foreign to the species in its state of natural growth.

The following facts support the above proposition:

1st. The "Rhubarbs" of Asia, after being transported to Europe, have lost a great proportion of their medical properties. According to Mr. Henry, 100 parts of the "RHEUM *palmatum*" from China, contain 74 parts of matter soluble in water and alcohol; the same root cultivated in France, and four years old, contains only 64 parts of the same; the "RHEUM *compactum*," 50; the "RHEUM *undulatum*," 36; and the "RHEUM *rhaponticum*," 30.

Analysis always discovers the same properties in them, but in different proportions; and the diminution is always manifest in the principles which possess laxative properties.

2d. The "CRAMBE *maritima*" has a disagreeable and strong taste, when it remains exposed to the influence of light; being deprived of its action, it becomes the "Sea Kale" which is relished by the English people as an agreeable article of nutriment. The same applies to the "TARAXACUM *dens leonis*," which is eaten in Paris.

3d. All the "LABIATES," the "VALERIANA *officinalis*," are more odoriferous, richer in essence or volatile oil, when they grow on dry, stony hills, than when they vegetate in low and humid places. The same plants are much more active and richer in the same essences in the South, than in the North. Heat and drought are generally favorable to the formation of essential oils within the organs of the plants.

4th. The "HELIANTHUS *tuberosus*," or "Jerusalem artichoke," which in its native soil of Mexico contains nothing but "fecula" in all the cells of its roots, does not yield an atom of starch when cultivated in France; the "inuline" then takes the place of starch.

5th. The "CRUCIFERÆ" and the "SOLANACEÆ" possess more developed properties in the ground where manure has been applied, than in uncultivated tracts.

6th. The "FUMARIA" which have grown on strong, manured lands, are found by analysis to contain 5 to 6 per cent. of "fumarine;" the proportion of this principle is considerably less when the plants spontaneously grow on a poor ground.

7th. The "Chicorium *intybus*," in its natural, spontaneous growth, contains in its roots and leaves an extractive matter which is rather bitter. By cultivation, this principle diminishes by degrees, so that both root and leaves may be used as food. The root is larger, the leaves and the stem are hairy, larger, thicker, and without indentations.

The root of chicory which is cultivated in the North, in order to make "coffee" with it, has no longer its bitter taste; it is even palatable, as a substitute for salsifis.

The following shows comparative results which were obtained from 100 parts of roots dried at 100° C.:

| | Wild chicory. | Cultivated chicory. |
|---|---|---|
| Organic matter | 92.982 | 95.10 |
| Mineral matter | 7.018 | 4.90 |
| | 100. | 100. |
| Soluble salts | 3.850 | 3.18 |
| Insoluble salts | 3.168 | 1.72 |

The saline matters were the same.

8th. Having compared both the "Rue" (Ruta *graveolens*) and the "Gaude" (Reseda *luteola*), in their spontaneous state with the same cultivated species, gave the following result, in 100 parts dried at 100° C.:

| | Wild rue. | Cultivated rue. |
|---|---|---|
| Organic matter | 91.014 | 92.02 |
| Mineral matter | 8.986 | 7.98 |
| | 100. | 100. |
| Soluble salts | 3.059 | 4.315 |
| Insoluble salts | 5.927 | 5.178 |
| Matter soluble in ether (resin, oil) | 4.59 | 7.98 |

| | Wild gaude. | Cultivated gaude. |
|---|---|---|
| Organic matter | 86.008 | 90.754 |
| Mineral matter | 13.992 | 9.246 |
| | 100. | 100. |
| Soluble salts | 7 327 | 5 120 |
| Insoluble salts | 6.755 | 4.126 |

The tinctorial power was three times more conspicuous in the cultivated "Gaude," than in the same plant which had grown wild.

9th All the varieties of the "Papaver *somniferum*" contain within their various organs, but more especially in the milky juice of their stems and green caps, some "morphine," with or without "narcotine," "codeine," and other organic, alkaline principles.

Numerous experiments made in Italy, Lander, Algiers, Auvergne, and in the north of France, and in England, show that the climate does not exert any perceptible influence on the morphine of an opium which is extracted from a poppy of any given species, but it is proven thereby that a good cultivation and the selection of the varieties of that plant, may cause considerable differences in the production of opium, as to the quality.

Thus, the variety known as white poppy with round heads, "PAPAVER *somniferum*, var. album et orientale," yields few seeds, but makes much opium; and the latter contains about 5 per cent. of morphine, and much narcotine. From this variety are obtained the opiums of Smyrna, Constantinople, Asia Minor, Persia, Egypt, and India.

The variety named "œillette" (oil-poppy), which is especially raised in the north of France, yields a small quantity of opium; but this is the richest in morphine; it contains from 17 to 22 per cent.

Another variety, named "brown purple poppy," produces a great many seeds and about half less opium than the white poppy; but that opium has 10 per cent. of morphine, and contains very little of narcotine.

10th. The "Coquelicot" (PAPAVER *rhoas*) contains no morphine in its several organs, even when it is cultivated on the same land and under the same climate with the "oil poppy;" this was proven by the experiments of MM. Benard and Decharmes, of Amiens.

The anodyne properties of the syrup of "coquelicot,"—very different from those of the opium, which combines the exciting and the sedative elements,—induce us to believe that the active principle of the "coquelicot" is some "codeine," which in this species take the place of morphine. Nevertheless, experiments last year were made with quantities entirely too small to enable the operators to detect, in a positive manner, the character of the "codeine."

11th. In the beet-root, there is always some sugar in a very manifest proportion; but whilst in the "Beta vulgaris," in its spontaneous state, the proportion is only from 4 to 5 per cent., in the same species improved by cultivation the sugar is found in the proportions of 8, 12, and even 14 per cent. for the same variety, as for instance, the "white Silesian beet."

Whatever be the ground on which the beet is cultivated, whatever be the geological nature of the soil where this plant spontaneously grows, its principal character is the abundance of potash contained in the root; the soda which is found along with it is always in very small quantities.

Doubtless, the elements contained in these roots change in their proportions, according to the soil, seasons, cultivation, and varieties.

Thus, in a land manured with the street scrapings of a city, the quantity of nitrate of potash, which is peculiarly found in that root, becomes enormous, and t such an extent as to be as plentiful as the sugar, whilst ordinarily the propor-ion of sugar is 20 times larger than the potash.

In the lands situated on the seashore and rich in salt, the beets absorb so much of it that it is impossible to obtain crystallized sugar from their juice, on account of the soluble combination which takes place between the sugar and the sea-salt.

At any rate, beets do constantly contain a very noticeable proportion of malate, pectate, oxalate, azotate, sulphate of potassium, and chloride of potassium.

The chemical nature of the soil may have a great influence on the production and the richness of solid matter in these roots; thus, taking as an example the white Silesian beet, we find (according to Girardin and Dubreuil) the production to be as follows:

| | K's. | Per cent. of dry matter. |
|---|---|---|
| In alluvial sand | 59.200 | 13.85 |
| In clay | 48.024 | 16.25 |
| In humiferous sand | 45.780 | 15.25 |
| In calcareous soil | 33.960 | 14.20 |

The various facts just presented seem clearly to demonstrate that cultivation, nature of the soil, and climate may augment or diminish certain organic or inorganic principles peculiar to the "vegetable species," but that they never go so far as to cause those principles to disappear, or to create some new ones. This is a new proof of the "invariability" of the vegetable species in its essential characters.

# PRESERVATION OF FOOD.

The greater part of those substances used for food can be had fresh and cheap during a short period in the year only. Commercial intercourse by land and sea, emigration, sea voyages, and expeditions for scientific purposes, the necessity of providing a supply of provisions against times of war and want—all these causes make it desirable and necessary to lay up food in store and in such a condition as will insure its preservation.

All organized substances when deprived of life undergo chemical change, by which they are in a greater or less time returned to the original chemical elements. The oxygen of the atmosphere is the first and chief cause of this dissolution, but its chemical action requires the presence of water, the temperature of which must be between 30° and 40°.

The various means in use for the artificial preservation of food, consist in the removing, either entirely or in part, the conditions which are favorable to a change. If all the methods in use in ancient or modern times, be reduced to physiological principles, it seems that the object to be attained, is either the seclusion of atmospheric air, or the removal of water, by drying, or keeping the substance in a temperature lower than that required for chemical change.

Those articles whose preservation has become a matter of great importance, are meat, eggs, milk and vegetables.

### PRESERVATION OF MEAT.

The surest method of preserving meat is a perfect seclusion of the air. Inclosing meat, after the method of Appent, in tin boxes, has been proved by many experiments as perfectly accomplishing the object. This method is as follows: Animal substances which have been well cooked are put in cylindrical tin boxes, which are filled almost to the brim; the lid, which has a small hole in it, is then soldered on. Through the hole in the lid the remainder of the can is filled with broth, and then this hole is closed. The boxes are now heated in a bath of salt water above the boiling point. If the box is not perfectly tight, the small bubbles will escape, thus indicating the defective spots, which are immediately closed. The boiling is continued for half an hour to one hour, according to the size of the boxes, and by it the oxygen remaining in the can is formed by combination into carbonic acid, and thus rendered harmless. After this process, the meat is not likely to spoil. It is, however, subjected to still another test, by being heated to a temperature of 30° R. for some time. If by this, decomposition takes place, it is known by the development of gas, in consequence of which the bottom will become a little convex, while on the other hand the pressure of the outside air should make it a little concave. Having passed through this test, no further danger of decomposition need be apprehended

Long sea voyages have proved this method of Appert's to be a very excellent one; and the preparation of animal food by this method has become an extensive branch of business. The firm of Gamble & Co., of London, presented at the World's Fair, in 1851, some boxes of food prepared in 1813, the contents of which were perfectly preserved. A portion of the boxes preserved at that time, which contained boiled mutton, taken by the Expedition to the Polar Regions in 1824, were thrown into the sea from the wreck of the Fury, in Prince Regent's Bay, 72° 47′ N. Lat., 19° 40′ W. Long., and found in a state of perfect preservation by Capt. J. Ross in 1849.

The top of the box is fastened by a rim of tin which is easily torn off, thus facilitating the opening of the box which might otherwise be difficult.

In this connection we may state that all sea voyagers who had occasion to test this food preserved by Appert's method, assert that this food became unpleasant, having the taste of "medicine," and that this at length became so disgustful that they returned to salted meat.

The methods of preserving animal food, based on Appert's principle, adopted by Fastier and Willanmez, have attracted much attention of late years on account of the interest manifested in them by the Emperor Napoleon and the French government. From the reports of the commissioners appointed by the Imperial Department of the Navy and by the Admiralty of Great Britain, to investigate the conserves of Fastier, we learn that boxes which had been filled a year or more, opened in Brazil, on the Senegal, and other points, proved perfectly fresh and excellent in every respect. In general, Fastier's method resembles Appert's, but he contrives to expel all the air, even from boxes containing 100 lbs. of meat; while by Appert's method, some air may easily remain, especially in the hollow bones of poultry. Fastier proceeds in the following manner: When the meat has been put into the box, a lid having a small hole is soldered on; through this hole the vapors escape by boiling. While the vapor is still escaping, the hole is quickly closed and soldered. The box is then sprinkled with cold water, which causes the vapor contained to condense, thus creating a vacuum into which whatever air may yet be contained in the bones and meat, escapes. After some time the lid is removed, and the boiling repeated until the last particle of air and vapor is expelled, and the aperture again closed. Thick tin should be used in manufacturing the boxes, especially large ones.

More recently, Nasmyth has modified Appert's method in the following manner: The meat is placed in boxes in the usual manner, but through the lid a small tube is inserted; through this tube a small quantity of alcohol is put into every box. The boxes are then heated as before, and the vapor of alcohol expels the air from the boxes. This process is continued till the vapor from the tube will ignite by contact with a flame, and then the boxes are shut. We can not decide upon the merits of this process. It is possible that the vapor of alcohol remaining in the box may unite with the remaining oxygen, to form *aldehyde*, a very interesting compound, discovered by Prof. Liebig, about twenty-five years ago. Baron Dumas, the greatest living French chemist, said, more than ten years since: "It is very possible that aldehyde is destined to be the important agent in preserving food. It absorbs oxygen and changes to vinegar, and thus acts doubly as a preservative." This significant remark has hitherto failed to attract the attention of scientific experimenters, but from the above method we find that it may have been accidentally employed. Chemistry teaches that most of the volatile oils found in the vegetable kingdom, consists either of peculiar aldehydes, or substances which, like aldehydes, are capable of combining with oxygen. When poultry are preserved for a distant market by elderberries, we may consider this but a modification of Dumas' proposition, as the etherial oil of elderberries, in the form of aldehyde, combines with the oxyen.

The process of Willanmez differs from the above by the use of glass vessels, a trio dilator, and the manner of inserting the corks. The dilator is a strip of tin bent in the shape of a spout, which is inserted into the mouth of the vessel while the operation of filling is going on, and which serves the purpose of the tin tube of the former method. The food is placed in the jar, and the superfices filled with broth or salt water. The bottles are then placed on a perforated wooden shelf, which is fixed in a kettle. This kettle is filled with a mixture of ten parts water, two parts kitchen salt, and two parts syrup. This mixture does not boil until heated to a temperature of 108° C. This is heated to boiling, and in this bath the bottles remain for an hour, when the corks, made air-tight with wax, are inserted. The bottles are then placed in the corking-press, the dilator removed, the corks pressed firmly in, and the bottles allowed to cool.

Another method, based upon the seclusion of air, has been proposed by Warrington, to prepare the flesh of the American buffalo for the European market. He pours plaster of Paris over the meat, and saturates this with tallow. This or a similar method was proposed by Dr. Arcet, thirty years ago, and has lately reappeared at Paris, which is, to inclose meat in gelatine. Niepce de St. Victor, a photographer, claims to have preserved fishes in this manner for several years.

This will suffice for the methods of preserving meat by deoxidation; but we have stated that meat might be preserved by depriving it of the water in its composition. The Indians of North America preserve the meat obtained in the chase by cutting it into small strips and drying. This process is called "jerking," and the meat so prepared is called "pemican." This process has the merit of giving a large amount of nutritive matter in a small space; still as the labor is great, and time required in drying long, it would not be profitable for foreign exportation; and besides, meat cut into so small slices is hardly fit for culinary purposes.

The preparation called meat biscuit is one of great importance. It is an invention of Gail Borden, who has established a factory at Galveston, Texas, where the abundance of cattle afford a plentiful and cheap supply of material. It is claimed that one pound of this biscuit contains as much nutricious matter as five pounds of fresh beef. It is well adapted to expeditions through wilds and deserts, and sea voyages, and is much used in expeditions against the Indians.

M. Boussingault has presented to the Academy of Sciences at Paris, a report on the "meat biscuit" manufactured by Callamand, of Paris. According to his report, the preparation of this article consists of three operations: 1. The preparation of the broth. 2. The manufacture of the dough. 3. The baking of the biscuit.

In preparing the broth, 51 pounds of beef are boiled for 4 hours with 24 quarts of water, 20 pounds of vegetables, such as carrots, turnips, garlic, etc., and the necessary spices, as nutmegs, cloves, pepper, etc. The bones are then removed, and the meat cut into small pieces, and again boiled in the broth for 1½ hours. By this time the whole is reduced to a pulp, in which half a pound of rock candy is dissolved, which is considered a preserving agent. In this way 11 quarts of a very concentrated broth are obtained, containing all the soluble substance of 44 pounds of beef, 7 pounds being lost in bones, sinew, etc.

In preparing the dough, the 11 quarts of broth are well mixed with 100 pounds of flour. The dough thus formed is cut in biscuits, which are baked in an oven for 1½ hours. When cool they weigh 180 pounds. The composition of this biscuit is as follows:

| | |
|---|---|
| Dry beef | 5.79 |
| Dry flour | 76.45 |
| Fat | 6.27 |
| Dry vegetables | 2.77 |
| Spices and sugar | 0 92 |
| Water | 7.80 |
| | 100.00 |

The commissioners appointed by the Paris Academy of Sciences to examine this biscuit, boiled one of them for fifteen or twenty minutes, and obtained a soup similar to that made by soaking common biscuit in rich broth. Thus a substantial and tolerably palatable food may be made, though the commissioners believed that the amount of nutriment was not as great as in the same quantity of fresh beef, as by the boiling some of the nutritive elements had escaped.

A well known method of preserving meat by extracting the water, is by pickling with salt, which absorbs the water, at the same time penetrating the tissues of the meat. In pickling, the meat is well rubbed with salt, and after a few days it is pressed in a press, and the operation of rubbing repeated. The meat is then packed in barrels and brine poured over it. Generally saltpetre is used with the salt, as it contributes to the preservation of the meat and imparts a fresh hue.

The opinion that the brine exracts only the brine from the meat is erroneous. Liebig, whose careful examinations of meat and its constituents, made in 1847, should be gratefully acknowledged, found that from one-third to one-half the elements of the meat were absorbed, and consequently the brine contains all the elements of both, and thus the composition of the meat is changed more by pickling than by boiling. In boiling, the albumen remains in the meat, but in pickling it is removed by the brine. Various other substances are also removed, thus destroying much of the power of the food, and producing such changes as may positively render it unhealthy. The scurvy which afflicts sailors is probably caused by their diet of salt meat.

A large quantity of pickled meat, prepared in America, is used in France. In 1856 M. Girardin instituted a series of comparisons, by which he was enabled to determine the amount of nutriment dissolved in the brine. The following is an average statement of their comparisons:

| | |
|---|---|
| Albumen | 1.230 |
| Other organic substances | 3 405 |
| Phosphoric acid | .481 |
| Kitchen salt | 29.007 |
| Other salts | 3.652 |
| Water | 62.225 |
| | 100.000 |

This proves that pickling in this manner is a very defective process for preserving, and it is very desirable that some other process should be discovered by which large quantities of meat may be preserved for transportation. The proposition to use sugar instead of salt, in order that the brine may also be used, is worthy of attention, but the process proposed by Underwood, of Manchester, is founded on a misconception of the process of nutrition. He recommends the use of a solution of argillaceous and acid clays, which have been successfully used in the preparation of anatomical specimens; but this preparation consists in changing animal fibre into leather, which renders it unfit for food.

The curing of meat by smoking has not yet been exactly demonstrated upon scientific principles. The warmth induced causes a drying of the meat, and the creosote, discovered to exist in smoke, coagulates the albuminous principles, and renders them insoluble. Besides these, it is probable that ligneous acid and other constituents of smoke perform important though uncertain parts. Although smoked meat will not compare with fresh in nutritive substance, still smoked meat is far preferable to that pickled by salt, because by smoking none of the constituents of the meat are lost. But whether the change caused by smoking does not lessen the nutritive power of meat, is a question yet to be determined by chemistry and physiology.

Vinegar, which we may now obtain so cheaply, is a valuable agent for preserving meat for some length of time, if the air is excluded from it; and sulphuric acid was some time ago recommended by Braconnet, and more recently by Robert.

A low temperature is one of the best agents of preservation. Meat kept in ice houses will not decompose. The corpse of Prince Mentschicoff, banished to Siberia by Peter the Great, was found in a perfect state of preservation 92 years after his death. A still more striking proof of the preserving power of cold is found in the mammoth discovered by Pallas in Liberia, all of whose immense bulk was found frozen.

In England fish, especially salmon, are packed in ice for transportation.

### PRESERVATION OF MILK AND EGGS.

Until recently the preservation of milk has been considered an unsolved problem. Appert steamed the milk and put into it the yolks of eggs before subjecting it to his process. Lignac, and others, put in sugar to facilitate its dissolving and to prevent souring. Steaming was then employed at a temperature not quite that of boiling till the milk had become reduced to a pulp In this condition it was exhibited at the World's Fair, in London, 1851. The preparation by Faduilhe, of London, was formed into square, yellowish-white cakes, about one inch in thickness, which are so solid that they require grating before they can be dissolved. Unprejudicial experiments made with Faduilhe's solidified milk, showed that it neither imparted the taste nor color of milk to the liquid in which it was dissolved. Even continued boiling of the substance in water failed to give a milky appearance. Recently various manufacturers have mixed carbonate of soda with the milk, in order to give the solution a white appearance; but this imparts an unpleasant taste.

A new method of preserving milk was invented by Madru, by which milk is kept in its natural state with all its properties unimpared, without steaming or mixing with another substance. In 1855, the inventor was awarded a prize of 1,500 francs by the "Association for Encouraging National Industry." In his method the milk is heated to a temperature of 80 degrees C., in metallic bottles, and cooled when the air is entirely secluded. These metallic bottles are always kept full, and are provided with a tube of tin or lead which leads into a receptacle above, which is also filled with milk. Into this receptable the milk rises when expanded by heat. On the surface of the milk in the receptacle is poured a thin film of olive oil. Twelve or fifteen of these bottles are put into a tight vessel, which is filled with steam, and heated for about an hour to a temperature of 80° C. By this time all the air contained has escaped, and the milk is suffered to cool down to 20° C. The volume of the milk decreases on cooling, and completely fills the bottle and tube above it. The tube is compressed just above the bottle with pincers, and then cut off and soldered tight. The bottle being completely filled, the fluid cannot be shaken, thus preventing the formation of butter. By this method milk may be preserved for months and even years. Eight bottles of this milk were opened eight months afterwards and found perfectly preserved; another bottle, which had been closed and sealed in July, 1853, was opened in April, 1855, after having been taken to Brazil and remaining there for six months. This milk was equal to fresh milk in every respect. In order to prevent the bursting of the bottles, they are allowed to cool, more or less, before closing, according to the climate of the region to which they are to be taken. If the milk is to be taken to a tropical country, the bottles are closed when at a temperature of 25° to 26° R. ; for countries of temperate zones, at 20°. Mabru's method seems to be very suitable for our dairies, as by it, in large cities, we could have the milk of May in the midst of winter.

In most methods for preserving eggs, the object is to seclude the air, for the shell is pierced with innumerable pores which freely transmit air. One of the oldest methods is to smear the eggs with grease ; another to dip them in lime water. The eggs are packed, with the large ends upwards, in a stone crock which is filled with lime water. This lime water penetrates the shell and forms the albuminate of lime, which excludes the oxygen of the air. In this way eggs may be preserved for culinary purposes, but they are much inferior to fresh eggs. Another method is to put the eggs in boiling water for a short time, by which the albumen is made to form a coagulated layer nearest the shell. The eggs thus prepared are kept in a cellar, packed in sawdust, or, what is still better, pulverized charcoal. It would also be an improvement if the eggs were dipped in a solution of gum arabic with sugar or glycerine, to prevent complete drying. The plan of dipping the eggs in collodion, or a solution of gutta percha, though theoretically correct, will not be found practical, on account of the dissolving menstruum, ether or benzole, penetrating the eggs, thus rendering them unfit for use. Recently it has been proposed to place the eggs in a solution of water-glass, in order that the chalk-like egg shell may be transformed into silicate of lime, and lose its porosity. The practicability of this method has never been demonstrated ; but it may be supposed that some constituent of this fluid will penetrate the egg and render it unpalatable.

### PRESERVATION OF VEGETABLE FOOD.

Of the many substances used in the preserving of vegetable food we will mention salt, vinegar, alcohol and sugar as the most important. Their use is based upon the fact that they cause chemical change, at the same time aiding in the seclusion of air.

In using salt for the preservation of vegetables, an extraction of water may take place as in pickling meat; but this is of secondary importance. If vegetables mixed with salt be placed in a warm place, a peculiar fermentation will take place, giving rise to the formation of lactic acid, or the acid of sour milk. It is this acid which fills the pores of sour crout and cucumbers when pickled with salt. In preserving by this method, the most important thing is to discover the time when the fermentation has reached its maximum, that the preparation may be removed to a cool place. If this moment is allowed to pass, and the vegetables are allowed to remain at too high a temperature, the lactic acid, which before was of a mild and palatable taste, degenerates into butyric acid, which is of fœtid odor, and the fermentation of which is the first process of decomposition.

A weak syrup of sugar has a tendency to decompose itself into vinegar and sour acids when acted upon by nitrogenous substances, but a strong syrup is more stable, and not only remains intact, but protects those substances saturated with it from decomposition. On this principle the preservation of fruit is founded. The juice of certain fruits, such as currants and gooseberries, when boiled, possess the property of forming a jelly, and this when combined with sugar, forms the jelly prepared from fruits. Fruits owe this property to the coagulation of gelatin and to the presence of pectin acid, a substance found throughout the vegetable kingdom.

In Germany, alcohol is rarely used for the preservation of fruits, but in France, such fruits as plums and prunes are preserved in brandy, and sold at the restaurants in the place of the schnapps of northern Germany.

Vinegar is often used in the preservation of substances which are more in use as condiments and stimulants than nutritious food. In order to keep such preserves the better, it is advisable that the vinegar first applied be changed after a time for fresh, as it will contain the water of the vegetables and be made weaker.

That method which appears to be of the most importance is Appert's, already described. This is especially adapted to the preservation of such vegetables as green peas, asparagus, etc. By this method the preserves, however, often spoil, notwithstanding great care in the preparation. In Landes, a department of France, the preservation of green peas had become an important branch of industry, which was suddenly checked in 1850, by the fermentation of butyric acid in every case. Dumas, then Minister, sent Prof. Farre to discover the cause. He recommended to close the vessels in which the vegetables were contained, when they were at a temperature of 8° or 10° above the boiling point. This for a time was a sufficient remedy, but since 1856 a temperature of 110° C. is no longer sufficient, and that of 115° is required.

Only a few years since the process of drying was applied only to fruit and a few roots, but lately it has been applied to all vegetables. M. Masson has greatly improved the preservation of dried vegetables by compressing them into cakes about five inches square and half an inch thick, by which the action of the air is diminished on account of their decreased surface. In this manner vegetables and culinary herbs are pressed and placed in tin boxes, or wrapped in tin foil, for market In this connection it is proper to mention the celebrated "camp food," which consists of cabbage, carrots, beans, turnips and potatoes, prepared in a similar manner. Before using, it is only necessary to soak this in warm water for half to three-quarters of an hour, and then it is prepared in the ordinary manner. By soaking, the leaves are brought out almost to their extent when fresh. While this preparation does not have the taste of fresh vegetables, it has nothing unpleasant, and in times when fresh vegetables cannot be procured, and for large bodies of men, it is an excellent substitute. Chollet & Co, of Paris, have a large establishment, where the preservation of vegetables in this manner is carried on. A firm in Frankfort manufactured pressed vegetables, of which they exhibited specimens at the Fair in Munich, in 1854, but those did not meet the expectations entertained of their value. The spinage and carrots of D. H.

Carstens, of Lubec, were better, and his preparations are so famous that the Baltic fleet of the Allies ordered large quantities from him.

Recently, Morel-Fatio has proposed a new method for preparing compressed vegetables, which consists in exposing them to steam of high temperature, and afterwards drying quickly. He says that according to Masson's method, by which vegetables are simply dried, the preparation must always have a hay-like taste, peculiar to dried vegetables, and that in course of time they must acquire an acid taste from the slow oxydation of the albumen which has not been coagulated. In his method the vegetables are washed, cut, placed on racks, and exposed to the action of steam. By this they are boiled without losing any of their elements. After being sufficiently boiled, the racks are removed to a room through which air, at the temperature of 35° to 40°, is forced by machinery. When dried by this, no more change need be anticipated, because the albumen has been coagulated by steam.

For a few years chemists and physiologists have paid particular attention to the important question, "How can we procure cheap victuals ? Eccentric heads have endeavored, but in vain, to convert wood-fibre into starch and bark into bread. But nature produces every year more food than double the number of the inhabitants of our earth could consume. For this reason the study of enlightened men should be not to create food from substances not adapted, but to preserve that which is already at hand. From what has been done during the last ten years, we may infer what will be done at no distant day. Bright hopes are before us, and the apprehension of increasing prices of food is unfounded. Hitherto the preservation of food has been subservient to the fastidious palate of luxury ; in future, this important branch of industry will serve the people at large, and furnish good, cheap and nutritious food.

# THE BEET—ITS CULTURE, PROPERTIES AND QUALITIES.

The beet is a native of the coast of Southern Europe—particularly of Spain and Portugal—where it grows wild upon the sea shore. As a food plant it is an *annual;* as a seed plant it is *biennial;* that is to say, the root comes to perfection during the first year, while the seeds are not produced till the second year.

All the different varieties of beets have been developed by culture from the wild plant. Formerly it was but little cultivated, but of late more extensively, until, in many places, it has taken the place of turnips and other roots as food for animals. It excels many other roots in nutritive qualities; thrives well in most localities; is attacked by few insects; is less exhaustive of the soil; furnishes a more palatable food for animals; and, above all, is becoming of more and more importance in the manufacture of sugar. Of all roots of its kind the beet attains the greatest size. In Belgium beets weighing 20 pounds are not unusual. While Napoleon I was a prisoner at St. Helena, a beet weighing 120 pounds was raised there, but this enormous weight was obtained by a growth of one year and a half.

According to Block, the sugar-beet contains 87.5 per cent. of moisture, and 900 pounds of beets are equal in value to 100 pounds of rye, for nutritive purposes.

### CHEMICAL ANALYSIS OF THE BEET.

According to Boussingault's elementary analysis, there were contained in 100 parts dried beets—

| | |
|---|---|
| Carbon | 42 75 |
| Hydrogen | 5 77 |
| Oxygen | 43.58 |
| Nitrogen | 1 66 |
| Minerals and ashes | 6.24 |
| | 100.00 |

According to Way's chemical analysis, 100 parts of beet contain—

| | |
|---|---|
| Silicious earth | 2.57 |
| Phosphoric acid | 3.08 |
| Sulphuric acid | 3 37 |
| Carbon | 18 32 |

| | |
|---|---|
| Calcareous earth | 1.95 |
| Talcose earth (magnesia ?) | 2.11 |
| Oligist iron (oxide of iron ?) | 0.60 |
| Potash | 24 79 |
| Natron | 13.75 |
| Chloride of sodium | 29.41 |
| Loss | 0.05 |
| | 100.00 |

The different varieties of beets are distinguished externally by the shape and color of their leaves, leaf-ribs and roots; internally by more or less crystallizable sugar. In the latter respect we have to speak of the sugar-beet only.

The sugar beets are varieties only of the common beet. As the culture of the sugar-beet increased, new kinds, more prolific in sugar, have been obtained by French agriculturists (de Dombasli, and others). The formerly common red beet (beta-sylvestris), although valuable for food, has been discarded in the manufacture of beet sugar. Lately, the white Silesian sugar-beet (beta alba) has been most extensively cultivated. This beet, which is of a white color, grows for the most part entirely beneath the surface of the ground. Its leaves are not high but wide spread. Its yield is great; it is not liable to injury from drought, and is rich in sugar. The beet with a red and yellow skin, with white and red interior, is a variety of this.

The richest in sugar, after the white Silesian, is the yellow white beet, recommended by Dombasli; but it is rarely cultivated and contains but little juice.

The white sugar-beet is preferred to all other varieties, because its juice is whiter, and therefore its color may be removed more easily than in other varieties. The smaller beets, with firm texture, are preferred to the larger varieties, as yielding more sugar in proportion to the quantity. According to Schadeburg, 100 pounds of ripe beets, of an average weight of three pounds each, gave only 7 pounds of sugar.

Prof. Siemans, in his report on the progress of the manufacture of beet sugar, mentions the red Guedlinburg beet, which, he says, is deemed preferable to the white Silesian, because it keeps longer, contains more sugar, grows entirely under ground, and has a small leaf crown.

### THE NEW RUSSIAN OR SIBERIAN SUGAR-BEET.

Hermann, of Moscow, has demonstrated that this root, of Russian origin, which is used by the Russian farmers for feeding cattle, is a root, spreading over the surface of the ground, in the shape of a plate, with few leaves, while its thin, short and perpendicular root penetrates the soil to a depth not exceeding one foot. It matures quickly, does not impoverish the soil, grows well in cold climates, and yields as much as the best. It grows in cold, mountainous regions, which are free from frost from fourteen to sixteen weeks only during the year, requires less expense and pains in cultivating, protects, by its plate-shaped form, its roots from heat, cold and drought, and yields a crop of from two to four pounds to the square foot, which is much easier to be gathered than the larger varieties. It is said to contain as much saccharine matter as the best sugar-beet, and from 1 to 1½ per cent. more than the common Silesian sugar-beet. This, therefore, might be cultivated to advantage instead of the sugar-beet, and also as a substitute for the potatoe in feeding animals. Experiments with this root have been conducted very satisfactorily, so far as the manufacture of sugar is concerned, and it is desirable that a more general trial should be made.

### THE PROPORTION OF SUGAR IN THE TABLE-BEET NOT THAT OF THE SUGAR-BEET, AS REGARDS QUANTITY AND QUALITY.

The quality of the sugar-beet is proportioned to that of the food beet as 5 to 3; that is, five parts of table-beet contain only as much saccharine and nutritious matter as three of the sugar-beet. Now if an average crop of table beets is computed at 10 tons per acre, there need to be raised 6 tons only of sugar-beets upon the same ground to obtain the same quantity of saccharine and nutritious matter. But as under the same circumstances there 7½ tons may be raised of sugar-beets per acre, it follows that the culture of the latter is attended with greater profit for purposes of feeding also. Experiments made in Silesia have been still more favorable to the sugar-beet. There, upon the same soil, have been raised 11½ tons of the long red beet per acre, while of the white sugar-beet nearly 10½ tons per acre.

## CULTURE.

### CULTURE OF BEET FOR SEED.

As good seed of a good variety is seldom to be had, it would seem advisable, as a general thing, for each to raise his own seed. The following rules may be of advantage.

1. The chief thing, after having secured a good variety, is to propagate it alone, and under such circumstances as will secure it from admixture. To secure this, care should be taken that no other kind is planted in the immediate vicinity. If you wish to cultivate two or more kinds, they should be planted at proper distances.

2. In gathering the crop, select the finest specimens for seed. They should be those which are most characteristic of the variety. The white sugar-beets, for instance, should possess very markedly all the characters of that variety as described above—should have a firm texture, without a red tinge upon the leaves, and not growing too high above the ground, for such are found to contain less saccharine matter.

3. From the seed beets, whose roots must be uninjured, cut off the leaves in such a manner as not to injure the embryo seed stalk, and thus securing a vigorous seed stalk for the next year

4. Place the beets upright in any cellar or vault protected from the frost. The roots should be covered with sand, which should be moistened whenever it becomes dry. Protect well from mice.

5. For raising seed, select a well protected piece of ground with a southern slope. The soil should be a strong loam containing much lime; for the beet belongs to the class of potash plants, and the seed is better perfected and ripens sooner the more lime there is in the soil. When this ingredient is wanting it must be supplied. It has often been observed that the seed plants never do so well in the garden as in the open field.

6. The piece of ground must be surrounded by a good fence, which will protect the crop against all injuries from animals.

7. In the fall, drill the soil as in raising beets; but little more work will be necessary in spring. The soil requires no manure.

8. In spring, after the last frost, take out the beets carefully into the fresh air, and plant them in rows three feet apart, and as deep as they formerly grew. Plant them twice as far apart as they stood in the field; for experience has demonstrated that single beets planted at this distance produce twice as well as when planted more densely.

9. During spring and summer loosen the ground several times and carefully free it from weeds. Shortly before or after blossoming, the tip of the seed stalk should be cut off in order that the seed may ripen sooner and more perfectly. It is also advisable that each stalk be supported by a stick while ripening.

10. The seed stalks should be gathered from time to time, as they become yellowish or bluish. As the seed falls out easily, and is eaten by birds, the stalks should be bound together in small bundles, dried, and kept out of the reach of mice, till the time for threshing and cleaning.

11. In winter the seed is spread out on a level floor, beaten out with a stick or stripped by hand, cleaned and packed in close boxes secure from mice.

12. Beet seed should not be raised on the same spot every year, for the soil becomes deprived of those elements which are necessary to its perfect development.

13. The culture of beet seed will become profitable if the grower, by care and attention, succeeds in raising good and constant kinds.

14. A change of seed is necessary as soon as, for instance, the white sugar beet degenerates—that is, shows reddish stripes within.

### SACCHARINE SUBSTANCE IN THE BEET.

The quantity of saccharine matter varies much according to climate, soil, manuring and variety. In calcareous, unmanured soil the beets contain more sugar than in a rich mould, or in fresh manured ground. The long beets growing above ground contain only 3 per cent. of sugar; the yellow ball-shaped beets from 5 to 6 per cent.; while the sugar beets contain from 9 to 10 per cent.

The saccharine substance in the body of the beet continues to be developed during the first month after gathering, but decreases after that, while the saccharine substance in the so-called "tail-piece," which is the richest portion of the beet, increases during four months after gathering. This property determines the proper time for manufacturing.

Beets which are kept during winter for seed develop the seed stalk in spring at the expense of the saccharine matter accumulated during the previous year. They also send out secondary roots, which, though containing sugar, are small, and for the greater part lost in gathering, preserving and cleaning. For this reason beets for sugar should be of the first year's growth.

According to the chemical investigations of Hermann of Moscow, the beet is always richer in sugar in temperate than in hot climates.

### CLIMATE.

As a plant of late maturity, the beet requires rather more of a warm than a cold climate. The young plants may endure a considerable degree of cold, but severe night-frosts impede their growth. Everywhere in Germany, except in inclement mountainous regions, the beet is already grown more or less extensively. Even in Northern Germany, beets of 15 pounds weight have been frequently raised.

In wet warm years the quantity of the yield will be large, while in dry, warm seasons the beets will contain more saccharine substance. Wet, cold weather produces more watery substance in the beet, and renders it less valuable in the manufacture of sugar. Severe frosts in autumn injure the beet if its leaves are removed before gathering. It is said that the beet deprived of earth and leaves, freezes when the thermometer indicates a temperature of from 28 to 29 (Fahr). If the beet is but slightly injured by the frost it will rot. It withstands drought better than any other roots of its kind. It is grown in the most varying climates, for we find it in Germany, Russia, Hungary, Galicia, Northern France, Belgium, &c., probably to a greater extent than in its native countries, Spain and Portugal.

### THE SOIL.

The beet, if well cultivated, thrives in all soils except those very sterile and dry, or very wet and cold. It thrives best in black alluvial bottom land, and in deep loam rich in humus. In ordinary soil, with proper cultivation, food-beets from 10 to 20 pounds in weight may be raised. The beet thrives well over a subsoil of marl, while soil having a sandy subsoil is injurious. From this it appears that beets grow best in the soil best adapted to the cultivation of potatoes, and that they will grow in any soil which will produce potatoes. Soil containing peat or muck in the subsoil will not grow beets.

Those beets which grow above ground thrive best in a compact shallow soil. The perfectly white beet, with spreading leaves, grows best in sandy soil. In compact, heavy soils the beet throws off numerous roots, which render cleaning difficult, and a stony soil prevents regularity in the formation of roots.

### ROTATION OF CROPS.

Although the beet possesses great adaptation to circumstances, yet the largest yield is secured by a proper rotation of crops. Beets are not a proper crop to precede winter crops, for the yield of grain and straw will fall short, to the detriment of the whole farm. If, then, the farmer desires to engage in the culture of beets, he must discontinue the growing of winter crops, or if this is impracticable, practice a rotation. After beets barley may follow, and after barley oats, as both crops extract but little potash from the soil, thus leaving sufficient for the beets.

The proper system of cultivating beets is by rotation, as, after a crop of winter grain, the ground is already prepared for the beets, and the manure which the previous grain crop received is now in a condition to be most beneficial to it.

The rotation of crops in the Magdeburg district differs in different localities; the so-called factory-farms, which grow beets almost exclusively, being distinguished from those which do not grow them exclusively.

1. The factory-farms are mostly in close vicinity to Magdeburg. The fields are divided into two or three, sometimes four portions. As wheat extracts much potash from the soil, it has been thought an improper crop to precede beets. On these farms barley is grown the first year and beets the second, or even for two or three years afterwards; and this rotation is said to succeed very well.

2. On those farms where the culture of the beet is not exclusive, it has its proper place in the rotation, and not more than one-sixth to one-third is planted with beets. At a meeting of agriculturists at Magdeburg, it was determined never to plant more than one-fourth of the surface in beets, unless the soil is in a very favorable condition, when the extent might be doubled. Dr. Koppe, of Wollupand Kienitz, in the Oder valley, whose farm comprises 2,200 Prussian acres, devotes 750 acres to the culture of beets. At the meeting spoken of above, the following rotation was recommended for that district: 1, clover; 2, winter crops; 3, hoed crops or beets; 4, summer crops.

Mr. Rimpeau, who possesses 3,000 acres of arable land, and plants 800 acres with beets every year, has advised the following rotation: 1, winter crops; 2, beets; 3, summer crops; 4, hoed crops.

Many farmers grow sugar beets after potatoes on manured ground; others grow them in clear fallow, and then reduce or entirely discard wheat. In Bohemia, and especially on the manor of Straus, the following rotation is adopted: 1, mixed fodder, well manured; 2, wheat; 3, peas; 4, rye; 5, beets; 6, barley with clover; 7, clover; 8, wheat; 9, beets; 10, oats.

In sections not very productive, the following rotations may be introduced: 1, winter crops, manured; 2, beets; 3, summer crops with clover; 4, clover fallow.

According to Hoverden, on the factory-farms of Silesia beets are succeeded by summer crops every third or fourth year.

In Crespel Delisse, the oldest sugar factory of Northern France, the following rotation for 100 acres is usually adopted:

100 acres winter crops, manured.
80 acres beets, 20 acres potatoes.
100 acres beets.
70 acres barley, 20 acres beans, 10 acres vetch.
100 acres beets.
70 acres barley, 20 acres beans, 10 acres beets.
40 acres clover, 60 acres beets.
100 acres beets.
60 acres oats, 40 acres vetch.

### RESTORATION OF SOIL EXHAUSTED BY BEET CULTURE.

For the restoration of soil exhausted by beets, the use of organic manures and the cultivation of other suitable crops. For this purpose lucerne in grown extensively in Europe, but in this country the culture of clover will be found the best fertilizer, as well as a profitable crop. The good effects of growing clover are apparent, even should three crops of beets succeed, and the advantages are not diminished should potatoes be grown one season, for they prepare the ground better for the growth of beets.

### MANURING.

It was once the popular opinion that beets produce largely, but contain less saccharine matter, in manured than in unmanured soil. For this reason there was a continual dispute between the producer and manufacturer on the question of manuring; the latter contending that beets should be grown in unmanured soil, because, when manured, the beets contain a large amount of earthly salts, which render the extraction of saccharine matter more difficult and imperfect. On the other hand, the grower, having his own profit in view, endeavored to produce the largest quantity by manuring. For this reason the manufacturers have protected themselves by contract, in which a normal yield per acre was specified. And if the crop exceeded this, the price was reduced in a certain ratio. This practice induced many growers to discard manuring. The yield commonly agreed upon was 189 cwts. of beets and 73 cwts. of leaves on unmanured ground, and 206 cwts. of beets and 85 cwts of leaves on manured land. It is always more profitable to grow beets on unmanured soil, and every grower who is a manufacturer will govern himself accordingly. Chemical analysis has shown that beets grown on freshly manured soil contain more watery substances. In 100 pounds of such beets 88 pounds of watery substance was found, while 100 pounds of beets grown on unmanured soil contained but 80 pounds of moisture.

The question as to the use of manure is, of course, different in different localities. The richer the mould and more compact the soil, the more detrimental is manuring; while a loose, sandy soil requires some manure. The kind of manure used is also of importance. Stable manure is considered the best. According to the calculations of the Court of Hoverden of Silesia, beets yield 50 per cent. more sugar when manured with rotten manure than when manured with fresh straw dung.

Sheep manure is best for raising seed. French agriculturists have found by experience that, by the use of stable manure, much potash and ammonia are contained in the beets, which constituents are detrimental in the manufacture of sugar. Many farmers haul the manure upon the ground in the fall or winter, spread it uniformly, and plow it under as soon as may be in the spring. Others plow their fields three times in the fall; first shallow, then deep, and third shallow, plowing under the manure.

Marl is highly recommended in beet culture, but, according to M. Kœgèl, an agriculturist of Pomerania, beets manured abundantly with fresh marl require a peculiar preparation in the manufacture of sugar. For this reason it should be applied to the crop preceding the beets.

Lime, also, is a very efficient agent, both in its primary effects and as a neutralizer of the many injurious acids which are formed in the soil. In northern France and in the Magdeburg district lime is used as a preventive of the beet disease with good results. But it must be remembered that the use of lime does not render unnecessary the use of stable manure, and he who considers other manures superfious will find the old proverb, "Marl and lime make rich parents but poor children," verified.

M. Hanewald long since recommended bone dust as a most effectual manure. The manner of applying it is as follows: The bone dust is mixed with the draining from the dung hill and fermented. It is then treated with a mixture composed of five parts water and one part muriatic acid; this is left undisturbed for several months, and is applied to the soil immediately before preparing it for the reception of seed.

Guano has been repeatedly used in England and Germany as a manure in the culture of beets, and with success. In Saxony experiments with genuine Peruvian guano and stable manure in the culture of beets resulted as follows:

| | Pounds. |
|---|---|
| On sandy soil were gathered from the acre without manure.......... | 16,800 |
| Manured with two cwts. of guano.................................. | 25,800 |
| " one hundred cwts. of stable manure.................. | 22,600 |
| " " " and one cwt. of guano. | 27,500 |
| " " " and two cwts. of guano | 30,600 |

Generally, one pound of guano will produce in the first year from 45 to 50 pounds of beets. The quantity of guano required is from two to three cwts. per acre on heavy soil, and from one and one-half to two cwts. on light soil. Experiments instituted in both England and Germany show that one cwt. of guano is equivalent to sixty or seventy cwts. of stable manure, but, as guano costs so much more, stable manure may be best used as an adjuvant.

Guano is uniformly used mixed with some other substance, as, for instance, ashes are to be preferred. The mode of spreading guano upon the ground differs. Sometimes it is distributed by a seive, at others broadcast by hand and harrowed in before sowing the seed. The English, when sowing beets in rows, use a drill, which is so constructed that a given quantity of the guano mixture falls first into the soil, which is then covered with earth to the depth of about an inch, upon which the seed is then deposited. In the Magdeburg district, guano and every other similar manure is deposited in immediate connection with the seed, and, used in this manner, one hundred weight of guano has produced extraordinary effects.

The so-called "pinch manuring" has been practiced with success, and is not so troublesome as might appear. By this method a small quantity of guano is strewn around the plant just before hoeing.

### CULTIVATION OF THE SOIL.

Nothing is more necessary to the profitable cultivation of beets than a thorough and deep cultivation of the soil, which will enable the beet to penetrate deeply with its root, obtain nourishment from the subsoil, and will also enable it the better to withstand extremes of unfavorable weather. Under favorable circumstances, the beet penetrates to the depth of twenty inches, and to this depth the ground should be broken up by means of the common plow, and afterwards with the subsoil plow.

In Silesia, the land intended for the culture of beets is generally plowed four times, and every time harrowed, and, if necessary, rolled.

When the culture in rows is adopted, the ground is broken up in opposite direction, and surface drains plowed. Surface drains are always necessary, if the field has lain in rough furrows during winter and is not underdrained.

Some farmers recommend to turn the stubble field shallow, and to press down the furrows with the roller. This allows the weeds to spring up soon, when they may be eradicated, after which the deep plowing takes place.

The greatest care is necessary to keep the fields free from weeds. Beets should not be sown until the weeds have been removed, and this should be done with thé harrow after every plowing.

### THE PLANTING AND TRANSPLANTING METHODS.

The majority of farmers are in favor of planting beets directly in the spot where they are intended to mature; a few advocate and practice the transplanting of the young plants from hot-beds. Here, as in other things, "the truth lies in the middle"—much depending upon rotation of crops, condition of soil, and local circumstances. The chief advantage of the former method lies in the larger yield, amounting to 30 per cent., and economy of labor, while the frequent loss of the tap root, the withering and consequent backwardness of transplanted beets, is a weighty objection to the latter. On the other hand, transplanted beets are said to thrive more vigorously, contain less saccharine matter in the leaves, and to produce seed better than those not transplanted. The circumstances in which it is never advisable are, compact and especially grassy soils. Much labor is necessary to eradicate the weeds, particularly if the season be wet.

### PREPARING THE SEED.

For planting, perfectly ripe seed is required, and all unripe seed should be separated with the utmost care, to insure uniformity in growth. Well preserved seed will retain its germinating power for three or four years. It is well to obtain seed from localities celebrated for beet culture. Farmers intending to grow beets for the manufacturer, will do well to apply to him for seed, as it is to his interest also that the best be planted.

As much of the future value of the crop depends upon the preparation of the seed, the following is an account of its preparation:

1. The French agriculturists, among whom is Chartien, some years since adopted the following method in preparing seed for drill planting: After threshing out the seed it is stamped with the feet or beaten in a wooden trough until the hulls are removed and few seeds cohere together. By this treatment the seed loses about one third its weight, and as greater uniformity is secured in drilling, one-third is saved in quantity. By this method also much labor is saved. When the seed is well cleaned, there is uniformity in the growth of the crop, and thinning and transplanting is done away with. The small and unripe grains are separated by sifting through a seive.

2. *For germinating the seed*, Peters, of Guestrow, recommends the following process: The seed is soaked from 24 to 72 hours in water. If further germination is desired, the water is drawn off, the seed placed in a bag, and this into a bed of hay or straw, where it is allowed to remain not more than three days. After this treatment seeds will sprout on the fourth or fifth day. If soaked but 24 hours, and afterwards treated as above, they will germinate in nine days; if soaked for 48 hours, in seven days. Another method is to soak the seed in warm water for 24 hours, when the water is poured off, and the vessel covered with a thick woolen cloth and placed in a warm room for from four to six days. A third method is to soak the seed in a mixture of muriatic acid and water for 12 hours; it is then put in an old linen bag, placed in a basket, and covered over with stable manure. In 24 hours the warmth will cause the germs to appear, when seeding must be done without delay.

For planting germinated seeds a proper time should be chosen; it should not be done too early in spring lest germination should be checked, especially if bad weather for some days should succeed planting.

Seeds grown in high and cold climates will produce beets richer in sugar when planted in warmer climates. For this reason the French manufacturers obtain their supply of seeds from Silesia, Sweden, &c.

### CULTURE OF SEED BEDS.

For the transplanting method it is necessary to grow a sufficient quantity of beets. For this purpose the following conditions will be required:

1. A well protected warm bed is selected. The vegetable garden is the most favorable spot, especially if exposed to the sun in the morning and at noon.

2. If the garden cannot be used for this purpose the plants must be grown in an open field, and upon the best soil possible. The beds should be protected from winds by dead hedges of straw and brush.

3. For seed beds the twentieth part of the land to be cultivated will be required; for instance, if ten acres are to be planted with beets, half an acre will be necessary for seed beds.

4. The beds must be cultivated with the greatest care, and well manured with stable manure, or, as is preferred, sheep dung or guano. In the fall the ground should be dug from twelve to fourteen inches deep, and well cleaned of weeds. Roehler recommends that in the fall stable manure be well mixed and covered in.

5. The seeds are put in rows four or five inches apart, and at a distance of half an inch from each other. They should not be sown broadcast, for it is then almost impossible to keep them cleared of weeds.

6. For protection from cold and rain the seeds should be thinly covered with straw immediately after sowing. This straw is kept down by sticks laid across. In two weeks the straw is removed, but if severe frosts are apprehended it must be replaced.

7. For protection against weeds, sawdust, chips, &c., are strewed upon the seed rows, and weeds between the rows are removed by the hoe.

8. If the plants do not grow well they should receive an application of manure from the hen-house, liquid manure or guano. In very dry weather only they should be watered with a mixture of river and dung water. If the plants stand too thick they should be thinned, lest they become weak and the stems too long.

9. The plants remain in the beds until they attain the size of the little finger, at which time they will withstand drought better and grow more rapidly on transplanting. They should be pulled with great caution. If the ground is hard it must be watered. Some recommend a copious wetting, that the soil may stick to the roots; others recommend to lift the plants with a spade. In order to keep the plants from withering, the roots are dipped by the handful in a mixture of soil, cow-dung and water.

10. The leaves are then cut off three or four inches from the root, care being taken not to injure the bud-leaves. The plants are then packed closely in baskets, and well watered. If transplanting cannot be done immediately, the roots should be placed in a cool, moist cellar. Generally speaking, no more plants should be dug than can be set out without delay.

### TIME FOR SOWING AND TRANSPLANTING.

The proper time for sowing and transplanting is when the ground is properly warmed, cultivated and pulverized, of the proper moisture, and, when frosts are no longer to be apprehended; and in transplanting, when the proper growth of young plants is obtained.

1. The time of *sowing* depends upon *climate, location* and *nature of the soil.* As the beet is a plant of slow maturity, it should be sown as early as may be, in order that it may become fully developed both in growth and chemical con-

stituents. In warmer climates they may be sown from the first to the middle of April; in more northern places from the middle to the last of April; while in colder climates it should be done during the month of May. Better crops may be raised from seed sown rather late than too early. In warm valleys, protected from cold winds, seed may be sown earlier than in fields not so favorably situated. The *nature* of the soil is also to be taken into consideration. In a strong, clean and dry soil the seed may be sown earlier than in any other kind.

2. The time of *transplanting* is determined by the same physical conditions of localities. In warm localities the plants will recover sooner from the effects of removal; and for this reason, the transplanting method is more advantageous in warm than in cold climates. Transplanting may be performed when the soil is too wet for planting the seed; on the contrary, seed may be planted when the ground is not moist enough for transplanting. If the young plants are not sufficiently grown, the transplanting should be postponed, however favorable other conditions may be. As a general thing, transplanting should take place during the month of June.

3. If beets are cultivated on an extensive scale, the seed should not all be planted at once, for in this case summer work may accumulate too much at one time and not be properly done.

### THE PLANTING METHOD.

A. *The culture in beds.* This is most profitable in hilly and mountainous regions, or for small farmers. The seed is sown either broadcast or in rows.

1. *Sowing broadcast.* This is to be discouraged, because of the difficulty in weeding and hoeing.

2. *Sowing in rows* is more advisable and in general use. With proper instruments, small furrows are made across the beds at the distance of 1½ feet apart. In these the seed, already germinated, is laid at regular distances, and covered lightly with the rake.

B. *The culture in rows.* In extensive culture this method is much more profitable, on account of the facility it gives to weeding and cultivating. The principal methods of cultivating in rows is as follows:

1. Formerly the seed was laid on every second or third ridge of the freshly plowed furrows, at a distance of 1 to 1½ feet apart. Two or more grains are placed in one spot. Land thus sown remains rough and uneven.

2. Sowing in rows on land plowed and harrowed is done in rows from 1 to 1½ feet apart, either with the drill or by hand. In seeding with the drill, the "beet planter," with furrower, scraper and roller attached, is recommended. Dr. Koppe opposes the drill, saying that planting by hand is better and but little more expensive.

Seeding by hand is done either in furrows marked out for the purpose, or by measuring with a stick at the time of planting.

3. Planting on ridges is sometimes adopted. In this case the ridges should be thrown up by the plow, and afterwards rolled lightly, in order that the top of the

ridge may be flattened, and any open spaces filled. The seed is then planted at regular distances as before.

In sloping fields much skill is required in making ridges, lest the crop is injured by the earth being washed away. If the field will admit, it should be thrown into ridges at right angles to the slope; if it will not, cross ridges should be thrown up at proper distances, which will drain off superfluous water. The advantage of this method is that the crop is less liable to be beaten down in heavy showers and covered with debris, neither is it liable to be injured by extreme wet weather. For these reasons it has come into general use in some localities. According to experiments made in Saxony, beets grown on ridges yield 15 per cent. more than those grown on level fields. The distance apart of the ridges should be about 30 inches. Very recently it has been contended by some that the soil becomes too dry in the ridges, and the germination of seed retarded, and therefore this method has been discarded by many.

4. The Hohenheim method is as follows: The ground is furrowed 3 inches deep, at a distance of 1½ feet; the seeds are planted in the furrow, 12 or 14 being placed together. By this method the young plants obtain sufficient moisture, and at the same time protection from cold and wind. In hoeing, the ridge thrown up from the furrow is drawn around the plants, and the roots are made to grow under ground, which increases the yield of sugar.

### TRANSPLANTING METHOD.

1. Beets may be transplanted into beds or ridges, as in the planting method. It is better that the crop should be too thin than too thick, for if too thick the beets will be smaller, and require more labor in cultivation and cleaning.

2. The best plants only should be transplanted. The smaller ones may remain in the seed bed.

3. For planting, the workman should use the dibble, an instrument with which to make holes for the insertion of the root. The plant should not be planted lower than it stood in the seed bed, and the earth should be pressed down lightly about it. In planting large fields it is advisable to follow the plow, but in no case is the practice of placing the roots in the furrow to be covered by the next slice commendable, for in this case the plants will not stand perpendicular, and their growth will be impeded.

### NUMBER OF SEEDS TO BE PLANTED TOGETHER.

Of course every seed endowed with vitality will germinate, under favorable circumstances; but as we may neither assure ourselves of the vitality of seeds, nor always control circumstances, how shall we be governed in planting? The number of seeds contained in one seed husk varies from 2 to 6; but as these, after germinating, are liable to injury from insects, drought, or accident, we can not determine precisely the number to be deposited together. In some cases seed-husks are planted singly; in others, as is the case in the Wirtemburg Central

Manor, 12 or 14 are planted together; and it is claimed that too many is better than too few. On this point we will not pretend to decide, but think that reason would certainly advise to adopt a mean between these extremes. And for this reason we would recommend that but 2 or 3 seed-hulls be planted in one hole, as from these may spring up from 8 to 12 plants. Experience has demonstrated that young plants are more likely to do well where several are together, than when isolated and alone.

### HOW DEEP TO SEED.

In Northern and Eastern Germany the seed is laid from 1 to 1½ inches deep, while in Southern Germany and Northern France it is laid from 2 to 3 inches deep. As a general thing, in cold climates with a stiff soil, especially if wet, the seed does better when planted shallow. Under ordinary circumstances, to plant 1 inch deep is considered shallow, 2 to 3 inches, deep. To plant deeper, as is sometimes done with the hoe, retards the germination of the seed, and may be otherwise injurious.

### DISTANCE BETWEEN THE PLANTS.

Sugar beets are commonly planted from 15 to 18 inches apart. On a rich, deep soil they may be planted closer than on a weak shallow soil, but if planted too near each other they will rob each other of nourishment, and of course the yield will be decreased.

In order to provide against extremes of weather, it is well to plant an extra seed at equal distances from the seeds laid before, but only 1 inch deep. In drouth the deep laid seeds will spring up, and in wet seasons the shallow planted, so that the effects of extremes of weather may be counteracted.

### QUANTITY OF SEED.

The quantity of seed required varies with the method of culture. If the seed be sown by the drill, less is required than when sown broadcast or in beds. Further, the quantity varies with the size of the seed. One pound of seed contains from 3,000 to 16,000 grains. In the different methods of drill cultivating, from 3 to 15 pounds are required per acre. In planting by hand, 2 to 4 pounds are required, according to the number of seeds laid together. Sowing broadcast, from 8 to 9 pounds are required. In planting seed beds, 2 or 3 pounds of seed will furnish plants enough to stock an acre.

### CULTIVATION.

The cultivation of the beet field consists in weeding, thinning, baring, loosening, hoeing, heaping, removing the seed-shoots, and lopping the leaves.

*Weeding* should be carefully attended to as soon as the young plants are from 1 to 1½ inches high. The ground is first loosened with a light hoe, and the shovel plow or cultivator should not be used unless with great care. After the ground is loosened, the weeds are pulled out with the hand. In ridge cultivation, the plow and cultivator may be freely used; still the necessary manual labor must not be neglected. Gœhler recommends the following method: The ground is loosened between the ridges with the cultivator, and two days later the loosened earth is thrown against the ridges with the shovel plow, taking care not to throw the earth so high as to leave the plants covered, or to form a ridge on either side. In loosening the earth with the hoe, the laborer should walk backwards and not forwards. Bright sunny days should be chosen for weeding, when the ground is sufficiently moist.

In two or three weeks, weeding and loosening is again performed. At the same time, the first thinning may take place advantageously.

*Thinning* the plants should be done as early as possible, in order that those remaining may have the benefit of air and light. This may be conveniently performed in connection with weeding. The proper time for thinning is when the ground is well dried, after a penetrating rain. The laborer stands with the row between his feet. Selecting the strongest plant, he holds it firmly down with his left hand, while with his right he removes the others which are superfluous. If the roots of the remaining plant have been laid bare, he must press down fresh dirt around it with his fingers. Some recommend to cut off the tops of superfluous plants, that the roots of others may not be loosened.

*Baring the roots.*—In the Palatinate this is a common practice. When the plants have attained the size of a quill, the earth is removed from around the roots as far as can be safely done. They remain in this condition until they have become two or three inches thick, when the earth is restored to its place. It is claimed that this treatment promotes the growth of the plants.

*Loosening the soil.*—This should be done twice or thrice, at intervals of two or three weeks. The instruments used are the hoe and cultivator. If the plants grow in rows or ridges, the cultivator may be used in the intermediate space, but a free use of the hoe must not be omitted in the immediate vicinity of the plants. The conditions under which loosening may be best performed are specified under the head of weeding.

*Hoeing and heaping.*—In hoeing, different styles of hoes are used, according to the fancy or preference of the farmer. As a general thing, a smaller hoe should be used at first, before thinning, than is afterwards required. After the plants have been thinned and have become two or three inches thick, the shovel plow is used to heap up the loose ground after hoeing. This requires care that the beets may not be covered deep, especially if they are a kind growing below the ground.

*Lopping the leaves.*—On this subject much has been said—some contending that a moderate lopping of the leaves is not injurious, while others have experienced its injurious effects as regards both quantity and quality. Comparative statements have shown it to be very injurious, for beets so treated are smaller and poorer in sugar, the crown more ligneous, and the ground about is deprived of their beneficial shade. Where the leaves are lopped early and repeatedly, as is done on some small farms, carefully instituted experiments have shown that three acres of beets, lopped twice, have, other circumstances being equal, produced less than two acres not lopped.

The seed shoots, however, must be removed early and repeatedly.

### GATHERING THE CROP.

It is a matter of great importance to determine the proper time and manner of gathering the sugar beet. The following methods are worthy of consideration:

*Time for gathering.*—As the beet is a plant of late maturity, and would continue to grow, were it not for frost, till the end of December or even later, it follows: That the longer they can with safety remain in the ground the better will be the yield. For the purpose of ascertaining the developement of saccharine matter, Pelouze, a French chemist, determined the amount of sugar contained in beets from the same field at different times. His experiments show an increase of three per cent. in sugar every twenty-six days. This increase in sugar would perhaps continue till November, could the beets remain in the ground, but as we are visited by frost before that time, it becomes necessary that they should be gathered in October.

Lately reliable investigations are said to have shown that the amount of sugar in beets is at all times proportioned to their weight, and that a young plant is as rich in sugar, in proportion to its size, as a full grown one. This, however, is flatly contradicted by the above mentioned experiments, and it is generally known that any fruit becomes richer in sugar the longer it remains upon the tree, and potatoes become more mealy the longer they remain in the ground.

When the beet leaves grow yellow and begin to fall in great numbers, and the growth of the top ceases, and the whole field changes from its dark green to a yellowish green appearance, the time for gathering has come.

A warm sunny day should be chosen for gathering. In most localities the beet tops are cut off and preserved for fodder before digging. But no more tops should be removed than can be beets dug at one time; for if removed the beets are much more liable to injury from frost. If the beets are sown broadcast they must be carefully pulled by hand; if planted in rows or ridges the plow may be used to loosen the soil. The beets are carefully freed from earth and placed in a pile. Care is required that they be not bruised either in gathering or hauling.

In some places the tops are not cut before gathering, but the beets are laid in circles on the ground with the leaves outside; the heaps thus formed are cone shaped, and the beets thus piled are protected from frost by the leaves. Where this method is practiced it is customary to gather the beets two weeks before the usual time.

*Yield.*—In Russia an average crop of sugar beets is estimated at 120 to 130 cwt. In the vicinity of Magdeburg 180 cwt. is called an average crop. Dr. Koppe has gathered 180 to 200 cwt. per acre in the Oder Valley. In Northern France 155 constitute an average crop.

### SALE OF SUGAR BEETS.

Formerly in many sections of Europe the beet sugar manufacturers complained of a scarcity of material; but of late, with an increase in the number of factories, the attention of farmers has been drawn to this branch of cultivation. No other crop has a more ready, cash sale; and, as a small extent of land, well cultivated, yields more profitably than larger, it follows that the profits of this branch of domestic industry mostly accrue to the small farmers.

Those things most necessary in obtaining the greatest profit from beet culture are, First, a good variety; second, a proper size, (the beet should be neither too large or too small); third, rotation of crops; fourth, careful harvesting, that the beets may be delivered to the manufactory uninjured.

The profit derived from the cultivation of beets is of course subject to variations, as all other merchandise, and it will not be necessary in this connection to give more than an estimate of average.

The German makes a net profit of 25 thaler per acre when beets are selling at 18 cents per cwt. This is a greater profit than accrues in growing wheat.

### DISEASES.

The *beet disease* made its appearance in France, for the first time, in the year 1845, and was especially severe in the Department du Nord. Whole fields were affected, so that it was not considered worth while to gather the crop, while the less affected fields yielded only one-half or one-third crops. The diseased beets have a harder and tougher flesh, contain less juice, and this less rich in sugar than the sound beets. The cause of the disease is a fungus which attacks the roots. This singular disease effects the juice, and even causes a partial or complete destruction of sugar. Payen observed a cryptogamic substance, which he calls sugar fungus, in refined sugar and in cane sugar stowed away in sacks in a warehouse.

In England, in 1848, there appeared the following symptoms of beet disease: The leaves of the affected plants grew darker than those of the sound ones; growth ceased and frequently knots appeared on the root the size of a goose egg. The inside of the root was found sound and free from insects.

In the proceedings of the agricultural societies at Paris, Valenciennes, etc., the nature of the disease, has been discussed. Payen, Dumas, Becquerel and other French physiologists, suggested that this disease was caused by an uninterrupted cultivation of the beet, on the same ground, for twenty years.

Another French agriculturist, Cressel Delisse, remarks that in his neighborhood, where beets had been grown on the same soil for fifteen consecutive years, they were partially destroyed by insects—both roots and leaves.

As a continued culture of beets draws much potash from the soil, and as this is supposed to be an indirect cause of the disease, an application of lime has been made to the soil with favorable results. In some portions of France, where this disease has prevailed, the farmers have erected numerous lime kilns for the purpose of liming the soil.

### ENEMIES OF THE BEET.

The *larvæ* of the *May bug* is very destructive to the young plant, and more so as it usually attacks it after it is too late to replace by transplanting. The only remedy against its ravages is the destruction both of the larva and perfect insect on every opportunity. It is recommended by some to sow salad and pimpernel with the beets, as the insects will feed on them in preference to the beet.

The *beet insect* (rhomaria linearis) is thin linear insect, one-half millemeter in length, of a rust red or dark brown color. It destroys the germ of the plants. A proper rotation, cultivation and dense seeding are the remedies most effectual.

*Field caterpillars* gnaw the roots of beets. The best means of destroying them is to build fires of straw or brush into which the perfect insects fly. This, however, will avail little unless the farmers of a district unite in their efforts at the same time.

The *milliped* and *yellow worm* are designated as enemies of the beet plant. These and other obnoxious insects grow and increase by fresh manuring—another reason why manure should not be freshly applied to the crop.

*Rabbits* are well known as lovers of the plant. When they are numerous they make great trouble.

In consequence of Mr. Mot's success in manufacturing sugar from the Beet, see page 6 of this vol., he petitioned the Legislature for encouragement—the following is the Senate's

## REPORT OF THE STANDING COMMITTEE ON AGRICULTURE.

Mr. Bierce, from the standing committee on Agriculture, to whom was referred the memorial of M. A. Mot, and Senate Resolution "to inquire into, and report to the Senate such facts as may be accessible relative to the properties and value of the French sugar beet, and the propriety of encouraging its cultivation in this State," report—

That the subject referred to the committee is so important in its nature, and so extensive in its range, that it cannot be brought within the space usually occupied by a committee report. It embraces political economy, history, agricultural chemistry, finance and mechanics.

### REPORT.

The petitioner argues, and the resolution pre-supposes, that a new source of wealth and taxation may be created by the cultivation of sugar beets; he asserts that the soil and climate of our State are adapted to the growth of this root; he exhibits specimens of beet sugar, made in Ohio, and he petitions the General Assembly for the encouragement of a new industry.

Doubt, prejudice and skepticism generally prevail as to the possibility of making beet sugar in America, because former attempts have failed.

Repeated failures were "also" experienced by other nations; still they have attained complete success; they now derive wealth and revenue from that new branch of agricultural industry.

The beet, in the hands of "free labor," has asserted its supremacy over the cane and slavery; beet sugar is no longer a problem to be solved; it is a fact as patent as steam or electricity. A nation like ours ought not to be left behind in this onward movement of the world.

In order that our commonwealth may profit by the experience of others, the committee resolved to trace in all its phases the history of the beet sugar industry, and to throw upon the subject as much light as possible.

### HISTORY.

In 1747, the Prussian chemist, Margraff, discovered crystalizable sugar in the beet root; but his manufacturing process was not practicable on a large scale, and the subject was abandoned.

Towards the end of the last century, Achard found a practicable method of extracting beet sugar, and published the details of his operations.

Some years later, sugar became very scarce on the continent of Europe, on account of the protracted blockade by the English fleets.

In 1810, Napoleon offered one million of francs for the first successful beet sugar factory which might have been established within the limits of his then immense dominions.

All competitors failed in the vain attempt to work according to Achard's method; most of them were ruined; and the offer of the premium was withdrawn after the battle of Waterloo.

In 1812, Napoleon ordered the formation of five public schools, in which nothing but the manufacturing of sugar was to be taught. Each pupil was to receive 1000 francs after three months of faithful attendance, and every one who would engage in raising beets or making sugar was to be relieved from taxation during a period of five years.

At the same time 100,000 francs were given to the Chemist Proust, and 40,000 francs to Fouques, as a reward for their experiments on a small scale.

In 1813, Napoleon ordered that four Imperial castles should be converted into factories, that their parks should be planted with beets, so as to produce no less than four millions of pounds of sugar in a year; his orders were being executed when France was invaded by the coalition of all Europe, and Napoleon fell from his throne.

In the meanwhile cane sugar had been accumulating in enormous quantities within the colonies and the warehouses of England, and prices were so much reduced that English farmers in fattening cattle and swine used imported cane sugar.

At the fall of Napoleon all beet sugar factories lost their support; they had to encounter large importations of cheap sugar cane, and every one of them was ruined. Then it became fashionable to ridicule the idea of making beet sugar, and even to persecute the persons who had been connected with it.

Ten years later, in 1825, some generals and friends of Napoleon had so far disregarded public prejudices against beet sugar, as to establish thirty large factories in various parts of France; their sugar was immediately taxed at the rate of 100 per cent., so that all were obliged to suspend operations.

The nobility were then ruling France; they had an interest in upholding the colonies, where slavery had just been re-established; they wished to show liberality, and they granted to a Mr. Dorion, at Martinique, a reward of about $100,000, for an improvement on clarification, which consisted in using the bark of the "Theobroma Gazuma," instead of bullock's blood. The policy of this transaction was to encourage slavery, whilst the competition of free labor was being checked.

True principles will prevail in spite of prejudice, ridicule and persecution. Science lent her support to the struggling industry of beet sugar; failures still occurred now and then, on account of mismanagement or oppressive taxation; but in 1840 the colonies began to lose ground; in vain did they resort to improved machinery and scientific methods; free labor had obtained such a supremacy that, in spite of capital and protection, slavery was allowed to die without a struggle in 1848.

At the present time cane sugar from French colonies is still protected by differential duties; beet sugar pays a tax of 27½ francs on the 100 kilos, (3 cents per lb.) besides its part of land tax, building tax, and manufacturers' patent tax.

Among other European nations the beet sugar industry was also hindered by failures, prejudices and taxation. It is now more or less prosperous, in proportion to the liberalism of governments.

Belgium, Holland, Baden, Prussia, Wurtemburg, Bavaria, Saxony, Austria, Hungary, Russia and Turkey, manufacture beet sugar; the climate or the policy of England seems to be adverse to that industry.

### ATMOSPHERICAL INFLUENCES.

Beet roots elaborate more or less sugar, in proportion to the heat that they absorb, provided that sufficient moisture supplies the menstruum of elaboration; all fruits are proverbially sweeter under the tropics than elsewhere. The same beets yield more sugar in the south of France, than in the neighborhood of Paris, whenever the summer is not too dry; however, the south of France is not adapted to the production of beet sugar, because, *the forests having been destroyed*, a constant drought prevails during summer and fall. Therefore *heat and moisture are the requisite elements of saccharine elaboration.*

Beets should not be planted too early, because late frosts in the spring will destroy the young plants; no other casualty is to be feared. They resist drought and moisture; they are almost free from parasites; they occupy the ground only during four or five months, and they are generally considered a sure crop.

The heaviest winter frosts will not affect the sugar in the beets, provided that they are not allowed to thaw and decay. Sugar can be made without detriment, from frozen or thawing roots, and their pulp can be safely fed to cattle, hogs, horses and sheep.

Beets may be planted in April or May, and harvested, *even unripe*, from July to November.

### SPECIES OF BEETS.

There are more than twenty varieties of beet roots; the following are considered as the most profitable, in regard to the production of sugar:

1st. *Beta sylvestris;* a kind of mangel würtsel, white inside and outside, white green leaves; 9 per 100 sugar.

2d. *Beta alba;* Silesian beet, white epiderm, round, pyriform; white green leaves; white, firm contexture, productive; keeps well; 12 per 100 sugar.

3d. *Rubra romana;* red beet, long, well-formed, red leaves; liable to decay; 10½ per 100 sugar.

4th. *Lutea major;* yellow beet, long, large, prolific; green yellow leaves; yellow contexture; keeps well; 10 per 100 sugar.

5th. *Imperialis;* a variety of the *beta alba*, improved as to saccharine production; 13 per 100 sugar.

6th. *Vilmorin;* a doubtful case, ill shaped, improved as to saccharine qualities; 17 per cent. sugar.

Experience has demonstrated that the red species is the most constant, and has a tendency to absorb all other races; therefore no reliance is to be given to any particular kind of seed, in view of obtaining a large per centage of sugar; a *vilmorin* on poor soil may not yield 9 per cent.; whereas a red beet on good ground may produce 14 per cent; in other words, "*the production of sugar is less dependent on the quality of beets than on the nature of the soil; atmospherical circumstances especially, and the mode of cultivation, exercises a great influence on the elaboration of sugar in the beet.*"

### NATURE OF THE SOIL.

Deep, alluvial lands are the best for the cultivation of the beet, provided that the subsoil be moderately permeable; otherwise the bulbs would become enormous, watery, and almost destitute of sugar.

Limestone soils yield moderate crops, but the roots are very rich in saccharine matter.

Clay lands return heavy crops; when underdrained, they produce an abundance of fine sugar; according to German agriculturists, an excess of iron seems to be detrimental to sugar.

Sandy soils, with sufficient moisture and manure, will give moderate returns both in quantity and quality; they are entirely worthless when lime is absent; plaster will not mend them; marl, lime, or phosphate of lime, will be very beneficial to such lands.

New clearings, marshy or stony soils are not adapted to the cultivation of sugar beets.

### MODE OF CULTIVATION.

The land should be plowed very deep, well divided, clean, and free of roots, new manure, and all decayed organic substances.

The general mode of planting is to drill in rows two feet apart, and to drop one seed every six inches, in order to secure one plant to every foot in the line; this will require 43,560 seeds; one pound of seeds contains from 20,000 to 25,000 grains; therefore 2½ pounds will plant one acre.

In clay lands, the seed ought to be deposited on the top of the ridge; in sandy soils, at the bottom of the furrow, or on a leveled surface; atmospherical circumstances will regulate the depth of the planting, one inch in dry weather, shallow when rain is imminent.

When the young plant has put forth four leaves, the land must be thoroughly cultivated with hoe and shovel plow; then intermediate plants are used to fill the empty spaces, the remainder may be transplanted, sold or destroyed; the process of hoeing and cultivating must be repeated, until the beets are able to outgrow foul weeds: this prepares the ground for the ensuing crop, which in a rational rotation ought to be wheat. No further attention is required until harvest.

Beets are ripe when the external leaves grow yellow, drop and decay; they must then be dug out with shovel or plow, and left on the ground; the leaves must be cut off with a knife or a shovel, and they may be fed to cattle, hogs and sheep.

Three or four days after, the beets ought to be stored into cellars or placed into heaps and covered with earth, like potatoes; in these conditions, beets can be kept until March or April; however, they should be disposed of as early as possible, because by the length of time the quality of sugar may be impaired, and its quantity diminished.

### MANUFACTURING PROCESS.

Beet sugar is made in the same manner as cane or maple sugar.

All successive improvements were made on utensils, machinery and chemical reactions; as, for instance, Achard improved on Margraff by saturating with sulphuric acid the excess of lime which is used for defecation; Howard invented the vacuum pan, to evaporate the juice with economy, safety and dispatch; the hydraulic press was substituted for the inferior screw press; steam took the place of hand labor; but the original principle of the whole operation is still followed, and may be summed up in three words, viz.: "extract, "clarify" and "concentrate" the juice of the sacchariferous plant.

### EXTRACTING THE JUICE.

This operation requires three implements: 1st. A "washing machine," to cleanse the roots; it is a cylinder, made with lath, one inch apart, and revolving within a box which is filled with water. 2d. A "grater" to grind the beets this is another cylinder, the surface of which is half covered with saw blades. 3d. A "press" to force the juice out of the pulp. With these instruments, and a motive power, three men can extract the juice from 10,000 pounds of beets in twelve hours.

The pulp, coming out of the press, may be fed to cattle, either fresh or fermented; 256 pounds of red beet pulp equal 100 pounds of dry hay, according to Boussingault.

### CLARIFYING THE JUICE.

This comprises the important operations of defecating and filtering; it requires two implements a kettle and a filter; the latter may be a barrel or a box.

The juice, running out of the press, is directed into the kettle; fire is kindled; when the liquid is at the temperature of 160° Fah. lime is applied, in the proportion of one quart to 100 quarts of juice; the lime may be dry or diluted; when the liquid reaches the boiling point, the fire must be removed; some time is allowed for the scum to rise, and for the sediment to settle; these being carefully separated, the liquid is poured into the filter, which must contain about 3 per cent. of fresh amimal charcoal at each operation, or 10 per cent. for three operations.

Coarse animal charcoal is always used for filtering the "juice;" fine charcoal is used for "syrups;" The former is worth 3 cents, the latter 7 cents per pound.

Exhausted animal charcoal has absorbed all the salts and nitrogenous substances which were contained in the juice; its principal element is phosphate of lime, precisely the same element that our lands want the most. A liberal supply of this article, which is always abundant in sugar factories, will so much favor a wheat crop, that a return of thirty to forty bushels of grain may safely be expected; that is what England obtains by improving her lands with the bones of her dead soldiers.

### CONCENTRATING THE JUICE.

Slow, protracted boiling changes sugar into molasses; therefore juice and syrup should be evaporated as rapidly as possible; this effect is produced at the low temperatures of 140° to 155°, consequently with economy of fuel, by means of vacuum pans.

Open, shallow evaporating pans, over a brisk, regulated fire, may be used with advantage in small factories.

Deep, cast iron kettles are good enough for defecation, but they are entirely worthless for concentrating syrups.

When the juice is reduced to the density of 25° Beaumé's saccharometer, it must again be filtered; but the filtering will not be good unless the animal charcoal be of fine grain. The syrup is then replaced upon a brisk fire, in order to undergo rapid concentration, down to 45° B. The concentrated syrup is allowed to cool, then it is placed into a warm room, where it s on crystallizes; the molasses are drained off, the crystals are left to become dry, and sugar is made.

### PRODUCTION AND COST OF BEETS.

According to French statistics, one hectare (2.40 acres) yields an average of 50,000 kilos of beet roots; that is, 110,000 lbs. to the hectare, and 45,000 lbs., or 22½ tuns to the acre. Two distinguished agriculturists—Mr. Kachlin, at Mulhouse, and Gasparin, in the South of France—are recorded as obtaining very heavy crops; the former at the rate of 150,000 kilos, or 67½ tuns to the acre; the latter 275,000 kilos, or 110 tuns to the acre.

A reference to the Report of the Ohio State Board of Agriculture, 1859, pp. 500 to 506, will show that our lands are capable of producing 35 tuns to the acre. We heard also of another crop which rated 65 tuns to the acre; but we cannot expect such returns, and we will admit the French average of 22½ tuns as probable.

The cost of 2,000 lbs. of beets is generally counted at 6 francs, or $1.15. French farmers sell and carry 2,000 lbs. of beets for 21 francs, or $4.00; they are then obliged to take back the pulp for 9 francs, $1.75. Deducting the cost of two transportations, they obtain about $1.50 for a tun of beets; that is, 35 cents net profit on one tun, or $8.87 per acre. This profit is increased by the value of the leaves and of the pulp, which are turned into milk, flesh and manure.

The process, labor and time of cultivation are almost the same as for raising a crop of corn. Our lands are cheaper and more fertile than those in Europe; seed can be procured at 25 cents per pound, and will amount to less than $1.00 per acre; we may therefore expect to produce the beet at about the same price as in France. We may liberally estimate the expenses for seed and cultivation at $20 an acre, and calculate upon the moderate return of 20 tuns; then we could raise a tun for one dollar.

The Ohio State Board of Agriculture received a letter dated Berlin (Prussia), December, 1861, from the Royal Society of Acclimatization, which contains the following statistics:

"The Zollverein Association hold 257 beet sugar factories, which, in the year 1859, manufactured 36,668,556 cwt. of beet roots. The tax being 5 silbergrossen (16 cents) per cwt., produced 9,000,000 of gulden (40 cents). The quantity of sugar made from the beets was 2,933,484 cwt., or 8½ per cent.

"The following shows how different professions profit from a factory working 10,000,000 cwt. of beets:

| | |
|---|---|
| To chemical manufactories........(Prussian dollar 67 cts.) | $160,000 |
| " tin plates for presses........................................ | 36,000 |
| " cloth for do. and filters.................................... | 157,000 |
| " willow twisting for " ......................................... | 16,000 |
| " brooms, shovels, bricks, wire twisting.................. | 16,000 |
| " hardware......................................................... | 39,000 |
| " forms, repairs, grease, light, apparatus................ | 240,000 |
| " masons, carpenters, joiners, glaziers................... | 113,000 |

| | |
|---|---|
| To brick and lime | 110,000 |
| " tubs for transportation | 100,000 |
| " nails | 10,000 |
| " paper | 6,000 |
| Prussian dollars, | 1,073,000 |
| American dollars, | 715,333 |

### INFLUENCE OF THE BEET ON AGRICULTURE.

The chemical composition of sugar, according to Berzelius, is—

| | |
|---|---|
| Carbon | 44.200 |
| Oxygen | 49.015 |
| Hydrogen | 6.785 |
| | 100. |

The constituent elements of sugar are derived from the atmosphere. The leaves and pulp of the beet return to the land; sugar only being exported. *Therefore, the beet sugar industry takes absolutely nothing from the land.* On the contrary, the beet actually bestows on the soil new and precious elements; the scum and sediment of defecation return the salts, gum, oil and gluten which were derived from the soil, and at the same time a quantity of lime which was not there, and will benefit future crops.

We have already said that large quantities of phosphate of lime are introduced in the shape of exhausted animal charcoal; we might speak of other chemical agents, which are used for clarifications (such as acids, blood and eggs), and bring new elements of fertility, but we will confine the argument to the beet itself.

The pulp coming out of the press weighs about one-third of the original mass; one acre gives seven tuns, 14,000 lbs. of pulp, which is an excellent food for cattle. At the rate of 70 lbs. per day, one acre will feed an ox during 200 days, *without cost.*

The pulp might be kept to last several months, but it is more convenient and profitable to dispose of it as soon as possible; hence the advantage of keeping an adequate number of cattle.

A single press, working night and day, as usual, gives 7000 lbs. of pulp in 24 hours, and will feed 100 head of cattle; French factories are generally supplied with six presses, and feed 600 head. The number of factories being 380, it follows that the beet creates a demand for 228,000 head of cattle every year.

### WHEN PREPARING FOR MARKET.

These animals receive an allowance of bran, meal, oil cake, straw and bedding, and they produce large quantities of manure.

To work and transport masses of beets, sugar, food, fuel and manure, a great number of men and horses congregate, and supply their quota of fertilization;

furnaces add their contingent of ashes; so that the land is brought to a point of exuberant productiveness by the constant influx of foreign elements.

Should there be no rotation of crops; should the beet be permitted to profit by the fertility which it causes, the average yield of the beet crop would be much higher, as in the above case of Kachlin and Gasparin. Four or five exhausting crops of wheat, linseed, poppy, barley, and rape seed are allowed to impoverish the soil, before the beet is called upon to impart to it a new vigor.

The beet sugar industry in France is concentrated within three or four counties, which now surpass all others in wealth, fertility and population.

### PRODUCTION AND PRICE OF SUGAR.

We extract the following statistics from the "Journal d'Agriculture," Paris, 1861:

During the year 1859, thirty-two sugar factories did not produce any sugar, because they found it profitable to make alcohol out of beets.

The other 349 factories sold 283,903,200 pounds of sugar, and 150,000,000 pounds of molasses.

The average price, including storage, freight and commission, was 6¼ cents per pound brown, 11¼ cents refined sugar.

To form an estimate of the probable cost of beet sugar in Ohio, we must not overlook the high price of labor in our country; on the other hand, we have cheap lands, fuel, and superior machinery; the cost of the beets has already been estimated at one dollar the tun, and we are told that three men can turn out 10,000 pounds in one day; we may, therefore, establish the following account for one day:

| | Dr. |
|---|---|
| Cost of 10,000 pounds beets, five tuns at one dollar | $5 00 |
| Wages of three men, at one dollar each | 3 00 |
| Lime and fuel | 2 00 |
| Animal coal, sixty pounds at three cents per pound | 1 80 |
| One man to evaporate | 1 20 |
| | $13 00 |

Cr.

Supposing only 3½ per cent of sugar and 4½ of molasses to be extracted:

| | | |
|---|---|---|
| 350 pounds sugar at four cents per pound | $14 00 | |
| 450 pounds molasses at two cents per pound | 9 00 | |
| 3,500 pounds pulp for nothing, | | $23 00 |
| One day's profit | | $10 00 |

The foregoing account was purposely exaggerated as to the diminutive per centage of sugar and the proportion of molasses; European factories extract from nine to ten per cent. of sugar, and from one to four per cent. of molasses; we see no reason why we should not do the same.

Theory indicates that the tenth part of a beet crop is pure sugar; the experience of a Sullivant demonstrates that one acre will yield at least twenty tuns of beets; therefore, our broad acres conceal in their bosoms four thousand pounds of sugar each and every year. Surely, American ingenuity will dig it out; then the supremacy of "free labor" will be undisputed, because, instead of paying tribute to the Southern plantations, we will send our "cheap" sugar to regenerated Louisiana.

The beet will open a new field for science and metallurgy; the former will supply chemicals and learned overseers; the latter, copper utensils, steam and pneumatic machines, filters, presses, grating and washing machines.

Our lands will recover their former fertility; our wheat crops will rise to their ancient standard of thirty bushels per acre; public fortune will be increased; heavier taxes will not be burdensome; agriculture, by becoming profitable, will gain the favor of the young generations who now desert her declining empire. Such has been the effect of the same cause in France and Germany; there the beet has effected a revulsion, a revival, a general return of intelligent young men, struggling mechanics, rich idlers and a flood of emigrants to the field of their fathers.

### CONCLUSION.

To sum up, France produces about 300,000,000 pounds of sugar, and half as much of molasses, which, together, are worth $30,000,000; on which the Government lay a tax of 36½ per cent., amounting to $10,000,000.*

We have seen what means were employed to bring about this result, and,

Whereas, Similar causes produce similar effects, the committee propose to adopt energetic means to forward the prosperity of the State, and therefore offer the following resolution:

*Resolved*, That the State Board of Agriculture is authorized to offer a premium of $1,000 to the first person who shall have planted, within the State of Ohio, no less than five acres of sugar beets; and manufacture therefrom no less than 5,000 pounds of good, fair, merchantable, crystallized brown sugar; and a specimen of white, refined loaf sugar, of no less than twenty pounds in a single, uncompressed block. The premium to be awarded on condition that the winner shall open his factory for public inspection, and instruct one apprentice at the choice of every Agricultural Society of the State.

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* Molasses is always made into alcohol, and pay in that State very heavy taxes.

# CHINESE AND AFRICAN SUGAR CANES, AND THEIR HISTORY.

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JOHN H. KLIPPART, ESQ., *Cor. Sec. Ohio State Board of Agriculture:*

SIR: I have been requested to give you the history and a treatise on the Sorgho and Imphee Sugar Canes, which I will now endeavor to do

The art of cultivating the Sugar Cane was practiced in China from the highest antiquity; the Chinese assert that sugar has been made from the cane in China for upwards of three thousand years. Previous to the year 1466, sugar was known in Europe only as a medicine, brought as were costly spices from the east, and bearing the name of *Indian Salt.* And though it was cultivated in a few places on the shores of the Mediterranean Sea, still it was not more generally used on the continent. In the fifteenth century it was introduced into the Canary Islands by the Spaniards, and subsequently into Madeira by the Portuguese, thence found its way into the West India Islands and Louisiana. In southern China is cultivated a cane which is highly prized in India, and in very many respects is similar to the "North China Cane." There is little doubt but that originally these canes were identical, but by being cultivated in a warmer climate and raised from *cuttings* for many hundred years, its power to produce seed has in a great measure become destroyed, and from this plant have been produced the canes of India, Arabia, North Africa, West India Islands, and America. When we consider the isolated character of the Empire of China, we can well understand the reasons why we have remained in ignorance of the *Sorgho Sucre,* or Chinese Sugar Cane plant, up to the date of its late introduction into France and the United States; and were it not for the merest accident, even to this day we should have remained in ignorance of its very existence.

The first appearance in Europe of Sorgho Plant (or North China Cane) dates back no further than the year 1851, at which time the Count de Montigny, being at that time consul of France at Shanghae in China, sent in compliance with official requests, to the Geographical Society of Paris, a collection of plants and seeds which he found in China. Among these were the celebrated Chinese Yam (*Dioscorea batatas*), and the *Holcus Saccharatus,* or the "North China Sugar Cane." Of the package of seed thus sent, only one single seed germinated, in a garden at Toulon. If from any cause—an attack of insects, by injudicious planting or manuring, by careless culture, or any other mischance—the plant springing from this seed had been destroyed, France and the United States at this day might have been without Chinese Sugar Cane, and might have remained for years without the knowledge of this valuable plant. This seed was planted by M. Roberts, Director of the Marine Gardens at Toulon. He planted the seeds intrusted to him with care, but he was disappointed, as only one tiny sprout appeared above the ground. No doubt he watched the future growth of this tiny plant with much interest, and cultivated it with care. His labors were rewarded by a plant of good size, strong and vigorous, from the roots of which sprang up six rattoons or suckers. The seeds attained a complete maturity, and were distributed through France. A gardener of Héeres, who received a part of these seeds, planted them with care, and the next year gathered *eight hundred seeds*, which were sold to the house of Vilmorin, Andrieux & Co., seed merchants of Paris, for *eight hundred francs!* They had now come into the hands of men fully sensible of their value. This seed was planted by the senior partner of this house, M. Louis Vilmorin. Numerous experiments were made by him during the season of growth, the result of which fully established his expectations, and gave him the basis for the work which was published by him in 1854, under the title of "Researches upon Sorgho Sucre, or Chinese Sugar Cane."

Curiously enough, there was received in France at about the same time a quantity of seed of a plant having apparently the same properties and almost the same appearance as the Sorgho, which had been discovered on the south-eastern coast of Africa, in the country of the Tula Kaffirs, by Leonard Wray. Upon comparing the plants derived from these widely separate sources, the remarkable fact was made apparent that in ability to yield crystallized sugar, to afford nourishment for stock, and in the requirements of cultivation and other peculiarities, they were almost identical; and much surprise was created that from this double source, and as if corroborative the one of the other, a greatly needed sugar plant, and one apparently of high value, should have been given to French agriculture.

Mr. Wray professes to have discovered fifteen varieties of this cane, but we are of the opinion that only two or three varieties will prove truly valuable, the balance being hybrids.

The Sorgho, from the north of China and Japan, and the Imphee, from south of Africa, although growing so many thousand miles apart, are no doubt the sweet reed mentioned by ancient writers, and the original cane from which has originated the sugar cane of tropical countries, the changes being caused by climate and culture.

## INTRODUCTION OF SORGHO INTO AMERICA.

In the month of November, 1854, D. J. Brown, Esq., of the United States Patent Office, returned to America, from Europe, bringing with him a quantity of seed of the Chinese sugar cane, which he had procured from M. Louis Vilmorin. This seed was distributed to the farmers of our country by the Patent Office.

Leonard Wray introduced the Imphee into the United States in 1856. The unprecedented success of a large number of our practical farmers, in every section of the union, in manufacturing syrup and even sugar from the Chinese and African canes, has caused the excitement on its cultivation to be considerably augmented in the last year; and, in the future, we may consider the sorghum plants as one of our staple crops. Our past experience with Chinese production certainly warrant us in the belief that there may be in use in China other plants of inestimable value, which, as yet, have not been brought to our attention.

The cultivation of the sugar cane in Ohio, and the States west of us, was commenced partially in 1857, and has progressed rapidly, and with such success, as to be now adopted as one of our most profitable crops. The value of the Sorgho and Imphee crops last year, in the States of Ohio, Indiana, Illinois and Iowa alone, is estimated at five and a half millions of dollars, and will be more than doubled this year.

Wooden mills were first used, but proving to be inefficient, are now being abandoned and iron mills take their place. Evaporating pans are also taking the place of the common iron kettles. Few establishments, upon an extensive scale, have been started for the manufacture of syrup or sugar—being mostly confined to the individual growers of the cane. But as the culture extends to increased crops in neighborhoods, manufactories adapted to the grower's wants will spring up.

### THE CULTURE AND MANUFACTURE INTO MOLASSES AND SUGAR.

The soil best adapted to the culture of cane is a warm, *sandy*, limestone loam, upland preferred. Cane grown on low, rich, cold, mucky soil will be large, but will take ten or twelve gallons of juice to make one of dark molasses, commonly called scorched, while it only takes five or six gallons of juice from cane grown on sandy soil. And, if grown on sandy soil, will not sour so soon after freezing as when grown on low, cold land. The seed should be well sprouted and rolled in plaster before planting. In securing seed take the upper half of the head. This will ripen ten or twelve days sooner than the lower part. Plant early in May, or as soon as the ground is *warm* and *dry*. Plow and pulverize the ground well. Do not plant or cover the seed too deep—if covered too deep it will rot in the ground. Plant in drills of three and a half feet—eighteen inches apart in the drill. Leave three or four stalks in a place, or if in hills leave six or eight. For the more stalks raised the more syrup—and large stalks produce no more than small ones. The furrows or rows should run north and south, in order that the earth about the roots of the plants may receive the benefit of the sun's light and heat. Plant about two quarts of seed to the acre if for syrup; if for fodder thicker. Cultivate as for corn up to the first of August, but do not disturb it after that time, as it will make it late ripening. The cane when young presents so much the appearance of grass that care must be taken in working it. At this time it would be best to work with the hoe. Indifferent culture will make an indifferent yield, and will not pay for the use of the land and the labor expended on it. But on the right kind of land, and that well cultivated, no crop can be raised that will pay the farmer better for his investment and labor.

There are some varieties of the African or Imphee cane that is considered better for sugar than the Chinese or Sorghum. Of these Oom-see a-na and Boom-vwa-na are thought to be the best. Chinese or Sorghum is the best for molasses.

Commence working up the cane as soon as the seed begins to ripen, commencing with the most forward. If the cane cannot be worked up so as to escape early freezing weather, it should be bladed and topped, then at once gathered and hauled, and placed in a house shocked up so that the air can pass through it freely. It should be sufficiently protected from freezing and thawing by covering it over with fodder or straw. In this situation it may remain some time without injury. Slight freezing does not injure the cane, but benefits it if worked up before thawing; but a warm Indian summer, after frost and freezing, does injure it very materially. I would advise the operation of syrup boiling to be commenced as soon as possible, and continued without intermission until the crop is worked up.

The process for making molasses or sugar is quite simple, with proper utensils to work with, and it only requires good skimming and some judgment in boiling. We have found that quick and rapid boiling from the beginning is sufficient to remove the gum and other substances. Never let the juice be more than three inches deep in the evaporator pan. Sometimes, when the cane is green, a little bi-sulphite of lime or a very little table soda, dissolved in a cup of water, and poured slowly into the juice, when partially boiled, until the syrup begins to foam, may be of advantage if used correctly, but we would not recommend it as a general thing; for experience has proved that very good syrup can be made without the use of chemicals. A hot fire, with a thin strata of juice and good skimming, will insure good syrup.

To the farmers who still use the common iron kettles, I would say, set your kettles so that only the bottoms will be exposed to the fire. This prevents the fire from striking up the sides, and secures the syrup from burning Use a small quantity of juice, and boil right down.

*To make sugar.*—Use ripe cane and boil thick, then have a *tight, warm* building with a good stove—place within it vats made about eight feet wide, twenty feet long and four inches deep—run the syrup from the evaporator into these vats—then keep the room heated to a certain temperature day and night, say ninety-five degrees Fahrenheit. Stir about once a day during the process of crystalization, and in less than ten days it will be sufficiently granulated. Then take a long hoe and draw it into a ridge in the middle of the vat, and the syrup will run off to the edges. Keep it still in a ridge, and make the room still hotter, and you will soon have dry sugar

Stationary evaporator pans, on a brick or stone furnace, which can be erected by the farmer at a small cost, are preferable, being less costly, giving more heat with less wood, more simple and convenient in operation than the portable evaporators.

It is important to secure good seed. Much of the seed when first introduced into this country, owing to the high price it was sold at, was mixed by vendors with chocolate and broom corn;* from this cause, and probably a change from its native climate, the seed has degenerated, and the yield of syrup has decreased very much. It is desirable that some arrangement be made to import a supply of fresh seed direct from China, and the attention of the Seed Department of the Patent Office, the United States Agricultural and State Societies should be drawn to this important object. Chinese cane is now cultivated by the native Chinese in California, from whom pure seed can be readily obtained, either from their own growth or direct from China. We might also learn from them how to make sugar successfully. I offer the foregoing as the result of some observation and experience, in the hope that there may be some suggestions useful in the aid of the extended cultivation of this valuable crop, destined to be of immense importance in adding to the wealth of our Western States.

I am, yours respectfully,

JOHN J. DOUGLAS.

ZANESVILLE, O., July 25th.

## GROWTH AND MANUFACTURE OF SUGAR AND SYRUP FROM THE CHINESE AND AFRICAN CANES.

BY JOHN L. GILL.

RESULTS OF THE INTRODUCTION OF THE SORGHO AND IMPHEE CANE INTO THE UNITED STATES.—A wonderful interest has been aroused in the whole people of our Union, by the introduction of the Sorgho and Imphee cane, which has greatly increased in the Northern States since the great rebellion of the Southern States, by which the sugar ports have been blockaded.

The result of the cultivation of these plants has been most satisfactory in every locality and soil where Indian corn is grown to perfection.

Many experiments have been made in manufacturing the juices of the Sorgho and Imphee cane, and with a great variety of results.

Some of the first operators became discouraged, being unable to produce any thing more than an inferior article of syrup, having a very disagreeable, green vegetable taste and smell. While others, experimenting on a small scale, were quite successful; evaporating the juice in a milk pan or cook stove, they made a very fine article of syrup, of a light color, and almost free from any unpleasant taste. This was principally owing to a rapid evaporation, using a comparatively large and shallow surface, by means of which the foreign matter is more readily separated and raised to the surface of the juice, and therefore the more easily removed.

The light color was owing to the short exposure of the juice to a boiling heat, with a quick and thorough clarification; the color being artificially produced by a long exposure to a boiling heat, and the burning of some of the impurities, where a timely separation has not been produced.

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* See Essay on Hybridization of Plants, by J. H. Klippart, at the close of the succeeding Essay on Sorgho and its Manufacture.

Thus the discovery of the advantage of shallow evaporation, led to the construction of large shallow evaporating pans; but owing to the difficult and tedious operation of removing the pan from the fire, to draw off the finished syrup, and supply the pan with fresh juice, a plan has been introduced, by means of which a running stream of juice through the pan is obtained.

The juice enters one end of the pan through a faucet, from a tank or tub, and flowing through the pan, the defecated juice or syrup is discharged through a spout or pipe at the opposite end of the pan.

The juice is kept as shallow as possible (yet deep enough to insure a perfect covering for the bottom of the pan to prevent burning) in order to obtain the most rapid evaporation with the shortest exposure of the juice to a boiling heat, for it is evident that a body of juice one inch deep will require four times the length of time that a body only one-fourth of an inch will, in order to obtain the same concentration.

This mode of evaporation is quite advantageous, for there is no loss of time sustained in the operation; clarification and evaporation of the juice going on in its whole course through the pan.

For the better advantage of skimming, ledges have been put crossway of the pan, which serve to check the flow of the juice or scum, or both, when the operation of skimming is performed by passing a skimmer (made of fine wire gauze or perforated tin) across the pan between the ledges.

Some of those ledges are made to extend from side to side, and are provided with gates or openings at certain points for the juice to pass through; in others, the strips are attached only to the alternate and opposite sides, forming a continuous zig-zag or transverse channel, when the pan has to be set on a furnace inclining to the back end, in order to have the juice flow from side to side, and from one end to the other. Now, a perfect clarification can *never* be effected on pans constructed on either of the above plans, for the passing and mixing of some of the impurities with the juice in its course through the pan cannot be prevented, and the separating of some of the impurities require a peculiar treatment that cannot be had on these plans.

The impurities of these juices are of different kinds and nature, and are affected differently in separating and after being separated. Some rise to the surface of the juice before it reaches a boiling point, others immediately after, and some not till after it has boiled a short time and reached a certain density; some are deposited on the bottom of the pan at the early stages of evaporation, and others at a later period. Now, although these impurities appear to be of a compound nature, there seems to be but three distinct classes.

The first is a green scum or froth of vegetable matter, raised to the surface immediately before and after the juice has reached a boiling point. It is easily removed and requires constant skimming.

The second is a white mineral or earthy substance that is deposited and adheres to the bottom of the evaporator throughout its whole length, and if not frequently removed by scouring, will form a thick coating like cement, which can scarcely be cut with a chisel. The quantity of this deposit varies according to the nature of the soil upon which the cane was grown. Some cane produces a very small or scarcely any deposit, while from other cane a large deposit is obtained.

This deposit is probably a phosphate of lime, for it is insoluble in water; and where a large deposit is made, but little lime is needed for neutralizing the acid. It is not objectionable (till it forms a coating so thick as to retard evaporation), as it forms a good coating for the evaporator, and prevents a chemical action of the juice with the metal.

The third is a gummy, or resinous substance, of a yellowish gray tint, having a very disagreeable taste and smell; raises to the surface (like cream upon milk) after the juice reaches a density of about 13° Baume's saccharometer. When washed in water it is deposited, and resembles boiled starch. It is the most difficult, of all the impurities, to remove, for the agitation of the juice by a flowing stream over an inclined surface, or too frequent skimming, breaks the scum, when it is again diffused and incorporated with the syrup, some of which will be deposited at the back end of the pan, if but one is used, and in the second, if two are used, and will burn and color the syrup, and flavor it with its peculiar taste and smell. The balance will remain incorporated with the syrup, and will continue for many months to be deposited in the bottom of the cask, resembling dirt or mucus, and prevents granulation. When this substance is removed there is but little danger of burning the syrup.

CHEMICALS FOR CLARIFICATION.—Different kinds of chemicals have been used to promote clarification of the Sorgho and Imphee juices, but none are needed. A perfect clarification depends on the timely removal of all the impurities when separated. All the impurities contained in these juices (except acids) will separate through the action of heat alone; yet this must be properly applied in order to obtain a thorough separation, and aid in the operation of skimming.

LIME USED AS A NEUTRALIZER.—The acid contained in the juice may be neutralized by using a small quantity of lime. The lime to be slacked in water, making a thin whitewash, or as commonly known, milk of lime, and applied to the raw juice, in quantity of from one-half to one pint for every barrel of juice, the amount varying according to the quality of the cane.

THE BI-SULPHITE OF LIME is being very generally used on the sugar plantations of Louisiana for two purposes—one for neutralizing the acid, and the other to arrest or prevent fermentation. This is very important, for there is scarcely an article that ferments more readily than saccharine juice. Fermentation sets in immediately after the juice has been expressed from the cane, in very warm weather, and large quantities have been ruined in twenty minutes after it left the mill.

The bi-sulphite of lime is used with the best results in the manufacture of the Sorgho and Imphee juices, applied to the juice as it leaves the mill, in quantity of from one to two pints to the hundred gallons of juice. A small quantity of lime is generally used in the South, with the bi-sulphite, but this is not necessary when the latter is used with care.

WHAT METAL IS THE BEST TO USE IN THE CONSTRUCTION OF EVAPORATORS IS A QUESTION OFTEN ASKED.—The answer is, common sheet-iron, for it is less liable to a chemical action from the acid contained in the juice, than copper or galvanized iron, and is less liable to crack than cast-iron.

*Copper and zinc are poisonous metals,* though it is presumed that the evaporation of cane juice on either is not dangerous; yet any thing that will tend to produce poison is not desirable. A number of families have been poisoned by using apple-butter made from cider that had been concentrated on galvanized iron evaporators.

LAND SUITABLE FOR RAISING SUGAR-CANE.—The richer the soil without manuring the better, though a good upland is preferable to a black muck, as the latter will produce a large stalk but not a rich juice. A limestone soil is desirable, and should the soil be deficient in lime, a light dressing of lime should be applied.

SEED —Too much care cannot be taken in selecting seed. Procure seed that was not raised in the neighborhood of broom-corn, and that produced a rich quality of juice.* If you have to purchase your seed, procure the best without regard to price. A dollar per acre is no object, considering the difference in the cane.

SOAKING SEED —There is no doubt of the utility of soaking the seed; but as to the manner of soaking there is a great difference of opinion.

As good a way as any is to place the seed in a basket, and pour warm (but not hot) water over the seed, from once to twice each day for three or four days before planting, after which it should be kept in a warm place till ready to plant. Roll the seed in slacked lime to whiten it, to show how you are planting and covering.

PREPARATION OF LAND.—Prepare your land as for corn. Plow deep; subsoil if possible; roll it if lumpy. The better your land is prepared before planting, the less trouble you will have in cultivating, and the better the crop.

PLANTING.—Plant from eight to ten seeds in a hill, making the hills from three and a half to four feet apart. Planting in this way, it will not sucker so much as if planted in drills.

CULTIVATING AND THINNING OUT.—Cultivate as Indian corn, keeping the ground well stirred and free from weeds till it has reached a height of three feet. Thin out to five or six stalks in a hill, and let it alone till harvest; for if you continue to stir the soil, you will keep the cane growing and prevent ripening in season.

HARVESTING.—The cane is in the best state for harvesting when part of the seed is beginning to turn black, or in other words, when the seed is in a doughy state. The cane should be cut up and shocked in the field, (always in a dry place) and corn fodder put around the shock to keep it from the hot, cold or rainy weather.

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* See article on hybridization, by J. H. Klippart, at the close of this essay.

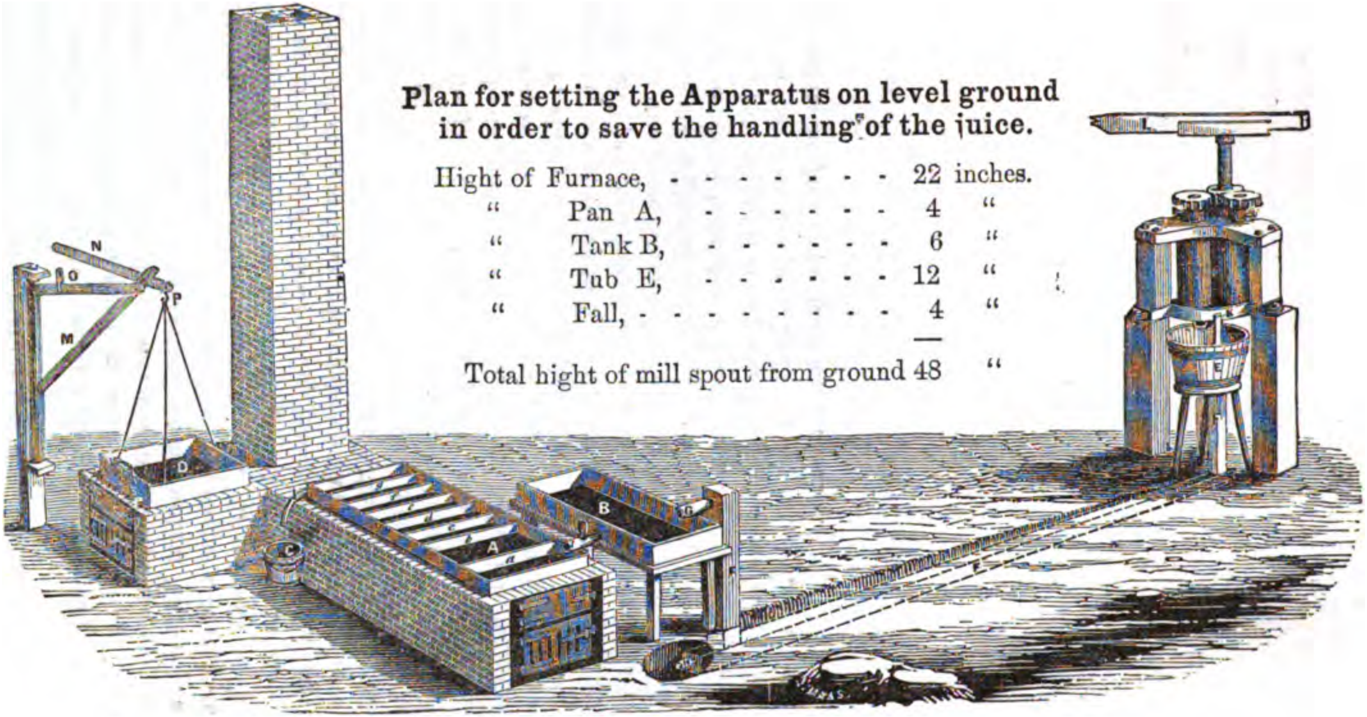
In this condition it may remain several months before being worked up, for the cane ripens, forms more saccharine and less green vegetable and foreign matter, consequently requiring less time, skimming and fuel to manufacture.

FREEZING AND FROST.—A very light frost does not hurt the cane before being cut up, but if there is danger of a heavy frost, it should be cut up, even were it not so forward as above described, hard freezing after being cut up does not injure the cane if protected as above described.

TOP THE CANE BEFORE WORKING.—From two to three feet of the top of the cane should be cut off and thrown away, for by working it you get no more syrup, while it requires more time and trouble to remove the extra amount of foreign matter.

COMPARATIVE VALUE OF THE SORGHO AND IMPHEE CANE.—There are many varieties of the Imphee, some are very early and others very late. Our impression is, that one of the early varieties of the African Imphee is the best and most certain to granulate, while the others are quite inferior to the Sorgho. It has been very difficult to obtain seed from this variety.

WILL ANY EVAPORATOR PRODUCE SUGAR WITH CERTAINTY, AND AT ALL TIMES?—Good sugar has been made, but cane grown upon some soils will produce syrup that will never granulate.



**Plan for setting the Apparatus on level ground in order to save the handling of the juice.**

| | | |
|---|---|---|
| Hight of Furnace, | 22 | inches. |
| " Pan A, | 4 | " |
| " Tank B, | 6 | " |
| " Tub E, | 12 | " |
| " Fall, | 4 | " |
| Total hight of mill spout from ground | 48 | " |

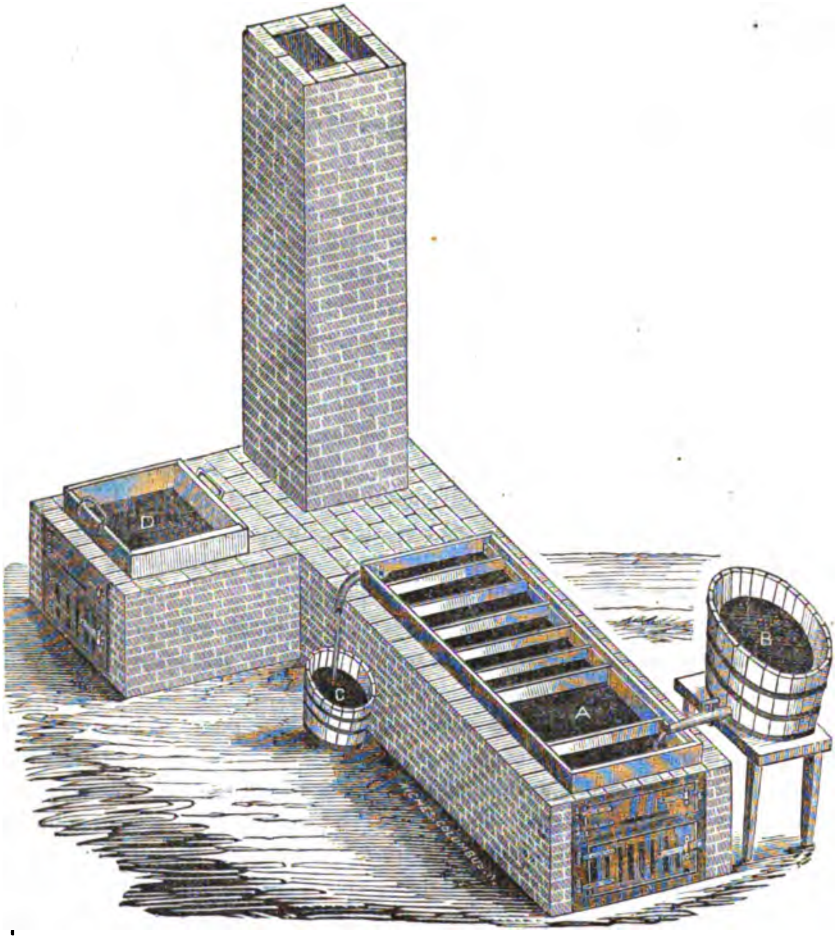
SETTING THE APPARATUS.—Have a shed or building over your evaporator by all means, and if possible continue it over the mill, then there will be no time lost in consequence of rainy weather.

Build your furnace twenty-two inches high. Procure three good posts from eight to ten inches in diameter, and from seven to eight feet long. Plant them firmly, leaving four feet above the ground, at a distance from the evaporator sufficiently great for the horses to pass around the mill without interfering with the manager of the evaporator. Bolt the mill fast upon the posts, as represented on the opposite page, and attach the sweep or beam L. If you wish to operate to the best advantage, procure solid pine tubing, such as is used for chain pumps, and lay it under the ground with a slight inclination as F from the mill to the tank B. Plug up both ends, and bore holes on the top side, now fit and drive two other pieces into these holes, one long enough to put a spout G into it above the tank B. Bore a hole in the bottom of a tub E, and drive it on to the vertical tube under the mill. Fit a long plug K into the hole in the bottom of the tub, that you may measure the juice if you wish, or stop the flow of the juice into the tank. A hole should be dug under the end of the tube at the tank B, large enough to receive a bucket, so that by removing the plug H, the juice may be drawn off from the pipe F, when you wish to stop operations.

A small crane, as represented by letter M, is of great convenience in lifting and swinging the small pan D off from the furnace, though it is not necessary.

Hang a small wire gauze funnel under the spout of the mill to catch the small particles of cane that might stop up the pipe F, or faucet I.

If you wish to use the bi-sulphite of lime, determine the amount of juice the tub E will hold, put the plug K in its place, then put the amount of lime into the tub required for that amount of juice, grind the tub full of juice and then draw the plug K and let the juice empty itself into the tank B.



The above cut illustrates a clarifier and evaporator invented by Cornelius Jacobs. It has been thoroughly tested for three years, and proven to be one of *the most efficient apparatus in use* for manufacturing molasses or sugar from the sugar cane ormaple juice.

It is made on an *entirely new principle*, combining all the important advantages in defecating saccharine juices, viz:

1. A rapid evaporation.
2. Short exposure of the juice to a boiling heat, without overheating the same.
3. Quick and thorough separation of the vegetable matter from the juice (which imparts the strong and disagreeable taste and smell so common to the Sorgho molasses), thus producing a syrup superior to the best golden syrup of the tropical climate.
4. It requires less wood or fuel than any other apparatus known.

5. Its simple construction renders it the cheapest and most durable apparatus in use.

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## DESCRIPTION OF CORNELIUS JACOBS' PATENT CLARIFIER AND EVAPORATOR.

Letter A represents a shallow Pan, in which the juice is first boiled (running a steady stream in from the Juice Tank B, and being drawn off into a Receiver C). It is divided into apartments by means of division strips (which can be removed for cleaning), running across the whole width of the pan, their edges bearing the whole length on the bottom. This pan is set perfectly level on the furnace The juice entering the front part of the pan is forced from one apartment to the other underneath the division strips, by the well-known principle of hydrostatics (that water will find its own level, etc). The division strips will serve to keep the scum back, and aid the operator in skimming. The juice should be kept as shallow as possible in this pan as will insure its being entirely covered, for the deeper it is the longer it will have to be kept on the pan, and consequently color it the more.

It is furnished with a new and simple contrivance for regulating the depth of the juice in the pan, and drawing it off when defecated.

The large amount of green vegetable scum is raised to the surface of the juice, and is removed by constant skimming in the three or four first apartments which are over the hottest part of the fire.

The third class of impurities spoken of on page 212 are raised to the surface in the apartments at the after end of the pan (the juice having been concentrated to a density of 13° Baume), and are removed once in an hour or two, allowing the juice to flow off under the scum. The force of the heat having been spent under the front part of the pan, these impurities are raised by a gentle heat, and form a scum like cream upon milk, which resembling cream in its nature, will not admit of agitation in boiling, too frequent skimming, or running over an inclined surface.

The juice is run off from this pan when thoroughly defecated, and reduced to about two-fifths its original quantity, to prevent its being heated a longer time than necessary in the cooler part of the pan, which will only blacken or color the syrup, and not aid much in evaporation.

The concentrated juice is now put into the pan D (which has n[illegible]rtitions, the skimming being nearly done, none are needed), and boiled rapidly till finished, which will require but a few minutes.

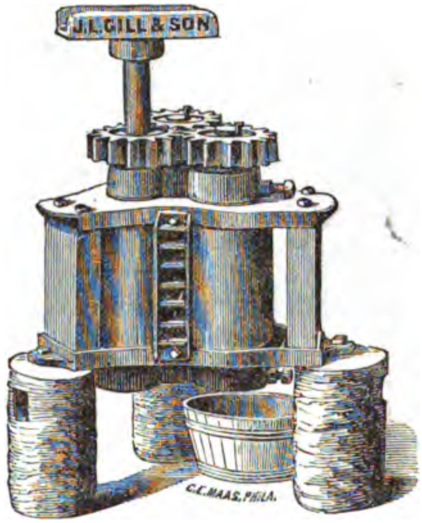
The pan D is then removed from the fire, and the syrup drawn off.

The pan will now be filled again (not to exceed one inch deep), and replaced on the furnace.

There are two doors furnished with each pan, one above and one below the grate bars, the lower one for the convenience of removing the ashes and regulating the draft.

Any kind of a kettle or vessel can be used to make molasses in; but, as the price of molasses and sugar varies according to quality, it is important to use the most improved kind of Evaporator, as by it, with a proper knowledge of the manufacturing of the cane-juice, the best sugar and best and clearest molasses only can be made.

The Jacobs Evaporator and Clarifier are furnished with two portable furnaces, made of heavy sheet iron, with cast iron door fronts, top plates and grate bars, and wrought iron legs and braces.



J. L GILL & SON'S VERTICAL CANE MILL.
*To which the premium was awarded at the State Fair.*

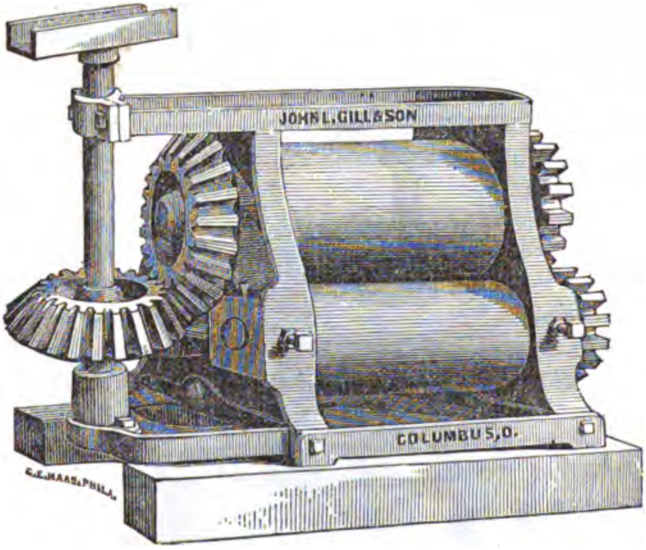
The annexed cut represents the simplest form of a Sugar Cane Mill, which, at one operation, removes all the juice contained in the cane. It consists of three rollers inclosed between cast iron top and bottom housings. The power is applied directly to a lever attached to the driving roll, which is the most economical application of power possible to be obtained.

This mill is made with the most important improvements now in use. The invention and construction of the proprietors.

The improvements consist in using a full solid box for the journals, and allowing the lower journals to bear on the bottom of the box and not on the housings. This enables the operator to graduate the space between the rolls, by means of the large steel set screws, without changing the position of the journal in the box. The lower journals are turned round and running constantly in oil, the unnecessary friction of the whole end of the rolls bearing on the unoiled housing is removed, consequently they run with at least one-third less draft than any other mill in use.

The oiling arrangement is the best in use, as the oil is conducted through iron pipes directly into the box, and as the bottom of the box is entirely closed up, the oil cannot escape.

We are using larger wrought iron shafts, and making much longer journals, than any other manufacturer. The importance of this is apparent, as a strong crushing power is required, and not a high speed.

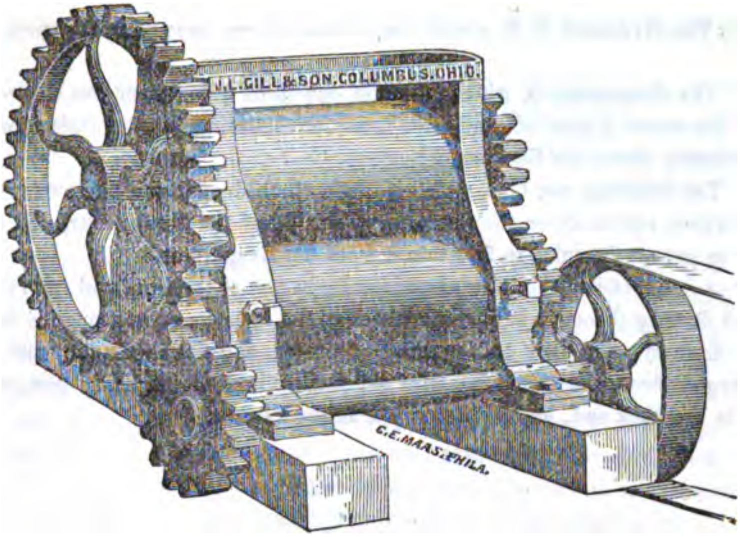

JOHN L. GILL & SON
COLUMBUS, O.
C.E.HAAS.PHILA.

HORIZONTAL MILL.

The question as to which is the best Mill for common farm use, Vertical or Horizontal, has long since been decided in favor of the Vertical Mill. But as a man cannot feed a Vertical Mill to a greater capacity than about 100 gallons of juice per hour, the Horizontal Mill is more desirable for large operations, as the cane can be fed into the Mill by the arm full on a table.

Horizontal Mill No. 8 is made with a vertical shaft which may be driven by attaching a long double sweep either above the Mill, as represented by the cut above, or by extending the vertical shaft below the floor, and working the horses in the basement.

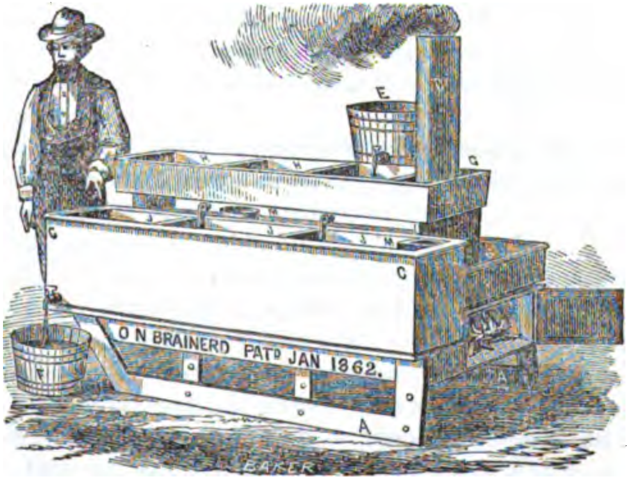
Capacity from 125 to 175 gallons of juice per hour. Has one 12 inch and two 9-inch rolls by 18½ inches long. Can be worked with either two or four horses; weight, 2,000 pounds.



HORIZONTAL MILLS FOR STEAM OR WATER POWER.

These Mills are furnished with a horizontal counter shaft, and back geared to reduce speed and increase the power. They may be driven by a tumbling shaft or by a pulley and belt. The shafts are extended through the gearing long enough to attach pulleys for cane and bagasse carriers.

No. 9. Capacity from 200 to 250 gallons of juice per hour; weight, 2,200 pounds.


E
G
C
C
O N BRAINERD PATD JAN 1862.
A

BRAINERD'S PATENT SUGAR BOILER.

This apparatus is constructed on the following stream principle, and has three pans:

1st. The Defecator H H, which has a false bottom, answering the purpose of a flue.

2d. The Evaporator G, which is made one-third wider than the Defecator, to allow the steam to pass off, and give room for skimming (as the Defecator is set immediately above the Evaporator).

3d. The finishing pan C C, which is made much deeper and narrower than the Evaporator, and is set on the furnace by the side of the Evaporator, and enough lower to permit the juice to flow into it from the Evaporator.

When in operation, the juice enters the Defecator at the front end from the tank E, and flowing through, it is discharged at the opposite end through a fine wire gauze filter into the back end of the Evaporator, and flowing to the front end is discharged through another fine wire gauze filter into the finishing pan, when it flows to the back end, and is discharged finished syrup.

# HYBRIDIZATION OF PLANTS.

BY JOHN H. KLIPPART.

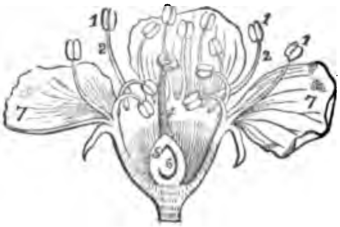
Ever since the Sorgho has been introduced into this country, an opinion has obtained that it would readily mix or hybridize with broom corn, chocolate corn, and other species of the HOLCUS genus. It has even been asserted that when Sorgho has been grown for several years in the proximity of the ordinary Indian corn, that it loses its saccharine properties.

From all that I have been able to learn from conversations with intelligent persons upon this subject, as well as from my own personal observation, I am rather inclined to attribute the deterioration of saccharine matter to soil, climate and culture, than to the influence of, or hybridization with, any other plants.

The principles involved in the hybridization of plants are precisely the same that must be observed in producing crosses in the animal kingdom. The product in the animal kingdom, of a cross between two individuals of the same *species*, or zoologic circle, is a *mongrel*, partaking of the form, aptitude and characteristics of both progenitors, and is capable of reproduction; as for example a cross between the Newfoundland Dog and Mastiff is a *mongrel*—not a hybrid—and is capable of propagating this mongrel type in a greater or less degree, and by very careful management this mongrel type may be perpetuated to such a degree of certainty as to become a permanent *variety*. But the product of two animals or individuals of different species or zoologic circles, is a *mule*, or *hybrid*, partaking in a greater or less degree of the paternal or maternal type, but entirely deprived of reproductive powers—as for example the cross between the horse and ass, or horse and quagga, ass and zebra, &c., &c.

In the vegetable kingdom the *varieties* obtained by crossing affiliated plants or flowers produce fruits which have fecundating powers, whilst the *hybrids* produced by artificial impregnation of flowers produce no fruit, or at most, if fruit is produced, the seeds are sterile.

Hybridization in flowers or plants consists simply in giving the germ or fecundating of one flower to another to be nursed and developed by it. In order to understand more clearly how this is done, it will be necessary to describe the parts composing the flower. It must not be forgotten that there are three kinds of flowers, viz: *male*, *female*, and *hermaphrodite* flowers. The catkins, or cylindrical form of flowers on the common hazel bush, are the male flowers, whilst the females on the same bush are small globular bud-like processes, with deep red fringe; the tassel of the Indian corn is the male flower, whilst the silk of the ear is the female flower. Some plants have the male flower on one plant and the female on another, as in the VALISNERIA *Americana*, or wild celery. But most generally the same flower contains both the male and female organs of reproduction, as in the apple, strawberry, lily, &c., &c., and these flowers are from this fact called hermaphrodite. Horticulturists, gardeners and some others have assumed the authority to name some varieties of the strawberry as staminate, others as pistillate, and others again as hermaphrodite. This classification may be unobjectionable so far as *practical* gardening is concerned, but so far as abstract science is concerned it is the sheerest nonsense, from the fact that the strawberry is neither *monœcious*—that is, it does *not* bear distinct male and distinct female plants on the same stalk; neither is it *diœcious*, or a plant that produces male flowers on one plant and female flowers on another; but all strawberry flowers are hermaphrodite. There may be varieties in the flowers of which the pistils predominate, yet upon examination quite a number of stamens will be found in the same flower; in other varieties the stamens may preponderate, but pistils are not absolutely absent from these.



The annexed cut represents the male and female portions of an hermaphrodite flower—the cherry. 1, 2, is the male portion, of which 2 is called the *filament* and 1 the anther—the whole (1, 2) is called the stamen 3, 4, 5, 6, is the female portion of the flower; 3, 4, is called the pistil—3 the stigma, 4 the style; 5, the ovarium; 6, ovule; 7 is a petal of the coralla. The anther (1) contains fine pollen grains, which are the fecundating principle; when the reproductive organs are fully matured the anther is ruptured, and the pollen grains are shed upon the stigma (3), from whence they find their way through tubes, through the style (4) into the ovule or ovules (6), and impregnate them. Hence any flowers whose ovules fail to be impregnated produce no seeds.

In many flowers the pollen grains are shed on the pistil *after* the flower is fully expanded, but in some the stigma has received the proper quantity of pollen before the flower expands, as in the tiger lily, wheat, rye, and many of the grasses; in peas and beans impregnation takes place before the full expansion of the flower.

If we desire to hybridize or cross the Sorgho on the broom corn, or chocolate corn, then we must obtain the pollen from the Sorgho *anthers*, and place it upon the *stigma* of the broom corn; or if the broom corn is to be crossed upon the Sorgho, then the pollen of the broom corn must be collected and placed upon the pistils of the Sorgho. It is my opinion that the pistil or rather stigma of the Sorgho has received the appropriate quantity of pollen before the flower expands—the same as in the wheat plant—and therefore there is no probability that it naturally hybridizes with any other plant.

Nothing is more simple than the method or process of hybridization; it consists in bringing the pollen which is contained in the anthers of one flower, into contact with the pistil of another flower. But there are certain conditions which must be strictly observed, otherwise there can be no successful impregnation; for example, the two flowers with which it is proposed to produce hybridization, must have attained the same degree of advancement, for crossing cannot be effected on others than those flowers which expand or bloom at about the same time.

The stamens are the male organs and the pistils the female organs of reproduction. The anthers of a stamen contain, in a delicate envelope, a very fine, powdery dust, the color of which varies according to the species, but which as a general thing is of a pale yellow. Each granule of this dust or pollen contains within a transparent envelope a mucilaginous materia, which is odorous, and is the fecundating substance of the male organ. The pistil ordinarily has a small spongiole surrounding the centre of the style, the stigmate of which is lubricated by a serous liquid, which has in an eminent degree the power of absorption. If we place upon the extremity of this stigmate a small drop of a colored liquid—for example, where the pistil is white, we use a liquid colored with carmine—the absorbing powers manifest themselves very strikingly, and the style will be colored down to its base. This is the duct which the pollen enters and traverses in the phenomenon of fecundation.

When it is desired to obtain a hybrid from hermaphrodite individuals, or those flowers which are endowed with the male and female organs, it is necessary to commence by removing the anthers from the flower. This operation is easily and readily performed ; all that is necessary is simply to take a delicate pair of pincers and remove the male organs—the anthers. This should be done in the cool of the morning, because the humidity swells the anthers and prevents the opening of the little sac which contains the pollen. Then from the flower with whose pollen we wish to impregnate, we must remove the stamens entire, and shake them gently so that the pollen dust may fall upon and adhere to the stigma of the flower from which the anthers had been removed in the morning. The most favorable time for scattering the pollen is at noon ; the heat of the day producing a dilatation of the pollen and facilitating its dispersion. To insure success, the operation should be repeated on the second day following.

Hybridization is an operation requiring dexterity, a light and steady hand, and it has been frequently remarked that the operation is more uniformly successful when performed by a female. Many singular facts with regard to the structure of flowers have been discovered through attempts to hybridize. In the common nettle the stamens have elastic filaments which are at first bent down so as to be obscured by the calyx ; but when the pollen is ripe, the filaments jerk out, and thus scatter the powder on the pistils which occupy separate flowers. In the common barberry the lower part of the filament is very irritable ; and whenever it is touched the stamen moves forward to the pistil. In the style wort the stamens and pistils are united in a common column which projects from the flower ; this column is very irritable at the angle where it leaves the flower, and when touched it passes with a sudden jerk from one side to the other and thus scatters the pollen.

It frequently happens in gardens that there are accidental crosses, which may be attributed to divers causes, but as a general thing owe their origin to the agency of insects, bees, bugs, &c. These accidental crosses happen most frequently in the cabbage tribe. Double flowers like the chrysanthemums are always sterile, and the hybrids as a matter of course cannot reproduce; but Mons. Gallesia has produced double flowers by crossing semi-double with semi-double ones, and has succeeded in obtaining fertile seed from semi double and even double ranunculus! Hybrids have been produced by horticulturists between the *ox-heart* and the Morello cherry; also between the damson plum and the wild Bullace tree.

Flowers appear to possess a much stronger attraction for the pollen of their own varieties than for that of strangers. Hence in order to be successful in hybridizing, it is very essential that a large quantity of the strange pollen be employed; it is also necessary that the flowers be closely related; crosses between individuals of different genera, or different species, although of the same genus, produce no result. Mr. Ad. Broigniart is of opinion that the difficulty which obtains in endeavoring to produce certain crosses, may be attributed to the inequality of the size of the ovules composing the pollen, which cannot, when they are too large, traverse the vessel of the pistil to reach the organs to be fecundated. It is also useless to attempt to produce crosses with those plants the seeds of which never mature in this climate.

The circumstances which are most favorable to the production of cross breeds or hybrids, have been well stated both by Herbert and Gærtner; but the remarks of the latter are most precise, and we avail ourselves exclusively of them, for the more sure guidance of the experimentalist—reducing them to the five following propositions:

1st. In most cases the preference for its own pollen is so strong that no hybridization will succeed unless it be completely excluded, even in the most minute quantity; and even where this condition is secured, much depends on propitious external influences. A certain degree of warmth is necessary—spring and autumn being far less eligible for hybrid fecundation than summer. The most favorable time, at all seasons, is in the morning; rain and moisture are alike prejudicial to natural and much more to hybrid fecundation, because the former often takes place in closed flowers, but the latter in those only in which the female organs are exposed.

2d. When the stigma is dusted at the same time, or within certain limits, with its own pollen, in sufficient quantity, and that of some other species, the latter is wholly inert, and the result is, plants not differing in any respect from the maternal: nor is the effect different if a division or portion of the stigma be dusted with either pollen separately; precaution being taken that there shall be no possibility of admixture. The elective affinity for the natural pollen makes the other completely negative.

3d. Agreement in the time of flowering is no necessary element—or the contrary a hindrance—if by chance or artificial means the pollen of the one species can be procured when the stigma of the other is ready. In like manner the duration of the time of growth or diversity of habit and persistence of foliage is, to a certain extent, indifferent.

4th. In some cases, especially in those where hybridization is rare, outward conditions, such as increased temperature, predisposition of plants for hybrid impregnation; and cultivation in general is favorable to this end, as it is to the production of deviations from a normal condition. Varieties are usually far more disposed to mix than the species from which they are derived, and hence the great difficulty of keeping our most valuable vegetables pure and genuine.

5th. Not only must the pollen of the hybridizing plant be in perfection precisely at the moment when the tissue of the stigma is in a fit state for its reception and the proper success of its functions, but even where the access of its own pollen is perfectly debarred from the stigma of a plant, the success of hybrid fecundation seems, from experiments, to require a more delicate and precarious adjustment of every favorable condition—to be a longer process, and therefore subject to more impediments; while all ungenial influences in normal fecundation acquire a greater force. The results, too, under precisely similar circumstances, are extremely different, whether as to the more or less complete setting of the fruit, or the number or perfection of the seeds produced.

Nothing can be more simple, as a general proposition, than the hybridization of plants; but experience shows that, in reality, it involves a variety of complicated considerations. For example, all plants will not impregnate each other; whence arises the question, Which plants will? Plants prone to mutual impregnation are very frequently impotent; what then are the circumstances which are essential to success? So again, the influence of the male or female parent respectively upon the offspring varies greatly, as does the quality of the offspring itself, in regard to productiveness, hardiness, vigor, and similar peculiarities. These are all questions which he who occupies himself with vegetable hybridizing, and who would not work at random, has to consider. They will be best answered by a statement of the views of some of the greatest of the experimentalists in this branch of vegetable physiology. According to Kölreuter, his experiments pointed to the following inferences: 1st. Varieties of the same species produce an offspring as fertile as themselves. 2d. Different species produce an offspring almost invariably sterile. This leads to the very essential distinction of cross breeds and hybrids, or true mules. The first are common, the latter rare. The varieties between the different sorts of white turnip are examples of the first; those between the Swedish and the white turnip, of the latter. More recent experiments, although they may not fully confirm the views of Kölreuter, as to his second proposition, do not materially affect the first. A circumstance of the greatest importance agriculturally, because it is obvious that a vegetable cross breed, however excellent, would be valueless to the farmer unless it could be multiplied by seed. Knight's whole life was devoted to the improvement of garden plants, by increasing their hardiness, or improving their quality, or rendering them more prolific, or altering their periods of maturity. He operated, however, uniformly on varieties of the same species, evidently regarding mere mules as more curious than useful, by breeding together the common American strawberry, and the variety called the black—a very bad bearer, but of excellent quality. He obtained a race of cross breeds, called Downton's, Elton's, &c., which have given rise to all the best of the market varieties now cultivated, unrivalled for their productiveness and excellence. By crossing the tender but excellent French pears with the hardy varieties of indifferent quality, he produced many of the finest winter pears now known; of excellent quality, like one parent —of perfect hardiness, like the other. It cannot be said that his experience was materially at variance with that of Kölreuter. Dean Herbert's exact views never were clearly stated, and it is difficult to collect them from his very elaborate but discursive essays. It is clear, however, that the difference from Kölreuter in regarding true hybrids as being usually sterile, founding his opinion more especially upon his experiments with rhododendrous, azaleas and endogenous plants. But as this is of no practical interest, and involves speculations that belong to pure and not applied science, we need not advert to it further. Among the more precise of Gærtner's conclusions, are the following:

Where impregnation takes place between two pure species, it is a universal rule "that the characters of the parents never remain pure and unaltered in the formation of the hybrid." In general every part of the new production is modified, so that it presents a decided difference from either of the parents, though resembling the one more than the other. In no case, however, are anomalous forms generated bearing no resemblance to either. At the same time, they are not produced according to mathematical formulæ and ratios; their differences are mingled in unequal proportions. There is a peculiar tendency of hybrids to luxuriance in their stem and foliage, and to be propagated with unusual facility by cuttings, layers, &c. Varieties of trees, therefore, could, he thinks, be produced, of much more rapid growth; which, for some purposes, might have their value, though the quality of the timber would probably suffer. Another peculiarity of hybrids is their precocity, of which advantage may be taken where early fruit is desirable, or where the summers are not long enough to ripen the later fruit. A most important quality of hybrids is also their power, in very many cases, of enduring a greater degree of cold than the pure species from which they are derived, and hence the acclimatization of many useful plants, by means of hybrid forms or varieties, may be effected. The hybrids, for instance, of tobacco, are far less susceptible of frost than their pure parents. The great fruitfulness of many hybrid varieties is also a material point as regards their useful qualities, especially in orchards and vineyards.

It is, perhaps, impossible to judge, with certainty, beforehand, what plants will breed together and what will not. The cross between *Pelargonium betulinum* and a tuberous species of the genus, was one of the last that could have been anticipated; and yet it took place without difficulty, and has given rise to a race with unlimited powers of change. The infinite multitude of experiments instituted by Gærtner produced no positive result upon this point, as appears by the following extracts from Mr. Berkley's abstract of his statements: " Experience shows that of a great—perhaps the greater—portion of plants is not susceptible of hybridization. Out of 700 species submitted by Gærtner, to nearly 10,000 distinct sets of experiments, only 250 true hybrids were raised. Allowing the possibility of repeated experiments proving that union is possible in some cases where it has not yet been obtained, the result is sufficiently striking, showing not only that the least portion of the vegetable kingdom is capable of hybrid fecundation, but that, as a general rule, it is a forcing of nature. In the larger portion of plants an harmonious concurrence of time and place favors the production of pure species, though this is sometimes disturbed, and, in consequence, hybridization, becomes possible; in any case, a certain harmony of either sexual element must exist to consummate a real hybrid union. In this concurrence consists the fitness for union of two heterogeneous species. For this purpose a mutual attraction between the stigma and the pollen must exist, the attraction being greater for its own pollen; and in proportion to the degree of attraction for heterogeneous pollen will be the fitness for union. But there is no outer sign by which the degree of such attraction can be known: it can be ascertained only by experience. It appears probable, too, that this attraction does not exist in an equal degree in every flower; at least the causes which prevent success are often perfectly inappreciable. It resides evidently in some peculiar constitution, which very possibly may accompany peculiar organization. As regards species we know as little on what peculiarities the power of producing hybrids depends, as in genera. No difference is perceptible in structure, and species which will not produce hybrids themselves, are sometimes capable of fecundating others; some will hybridize with but one species, whilst others show a greater extent of elective affinity. As, however, those which hybridize with one species usually are susceptible with regard to others, only in a different degree, it is possible that species which have hitherto united with one only, will be found, on further experiment, to have a wider affinity. It appears, therefore, that there is no external or structural character which can determine the aptitude of plants for hybrid union; the outward agreement in habit is, indeed a probable ground of success, but far from infallible, as it depends upon an invisible harmony of inward constitution. The aptitude amongst species, even for union, is scarcely ever present in an equal degree; nor is it necessarily reciprocal, but greater or less on one side than the other. On the whole, then, it appears that the fitness for union depends, not on the agreement of outward generic character, but on the inward nature of the procreative elements of individuals; so that two kinds of affinity exist, not necessarily proportionate or concurrent—an outward systematic and an inward sexual affinity. At the same time we must remember that genera are conferred by artificial: and that in groups, undoubtedly belonging to one common type, it does not follow that because one species will hybridize another will. In some cases where union will not take place, the species belong to different natural groups, and have been separated as such under generic names. The rough seeded œnotheræ will not unite with those which have seeds: the species of stramonium, with smooth fruit, with those which have thorny fruit; the species of heath, with cylindrical blossoms, with those which have bell shaped corrollas. Primulas, with a valvular orifice, as the common primrose, with those which, like the auricula, have the throat pervious; blue, with yellow flowerd flaxes; and so in many other cases. Such is the substance of Gærtner's views. In calculating beforehand the probable result of an experiment, it may be as well to bear in mind that upon the whole the cross breed may be expected to resemble its male parent more than its female. Mr. Knight raised, between a sweet almond impregnated by a peach, a cross that, in every respect, presented the character of a perfectly melting peach (physiol. papers, page 252). When the female azalea is set with the pollen of a rhododendron, the seed of the azalea produces plants most resembling the rhododendron; and we think that the balance of evidence undoubtedly turns in this direction.

M. W. Herbert states that he had produced numerous hybrids upon certain species and varieties of the Lily, which resembled the female parent in the stalk and leaves, but the male in the peculiar characteristics of the flower.

It frequently happens in gardens that there are spontaneous crosses, which may be attributed to divers accidental causes—as proximity of flowers—pollen being borne from flower to flower by insects, bees, wasps, etc., etc. These spontaneous crosses happen most frequently in the Cruciferæ Double flowers like the chrysanthemums are always sterile, and the hybrids cannot reproduce, but M Gallesia has produced double flowers by crossing semi-double, with semi-double ones, and has obtained fertile seed from semi-double and even double Ranunculus.

Hybridization has only commenced, but even as yet the most beautiful flowers are due to accident, but is it not well to investigate the laws of nature and aid them?

In 1694 Camerarius spoke of hybrid plants; in 1751 Linnæus wrote his *Dissertatic de plantis hybridis;* and in 1759 Kolreuter commenced and succeeded in producing hybrids by artificial fecundation.

The following is a list of natural hybrids discovered in the vicinity of Vienna, and described by A. Neilreich, a minute description of which he read before the Zoologico-Botanical Association of Vienna, at its meeting on the 7th of January, 1852:

| MALE PARENT. | FEMALE PARENT. | HYBRID |
|---|---|---|
| 1. Festuca Elongata,<br>(spiked fescue,) | Lolium Perenne,<br>(Rye grass or Darnel) | Festuca Loliacæ,* |
| 2. Scirpus Lacustris,<br>(Lake Bull-rush, round stem) | Scirpus Triqueter,<br>(Triangular Rush) | Scirpus Duvallii, |
| 3. Nigritella angustifolia,<br>(orchid) | Gymnadenia odoratissima, | Nigritella suaveolens, |
| 4. Ophrys muscifera, | Ophrys aranifera, | Ophrys hybrida, |
| 5. Salix fragilis,<br>(willow with smooth ovaries) | Salix alba,—(White willow<br>with glaborous ovaries) | Salix Russelliana, |
| 6 Salix fragilis, | Salix triandra, | Salix speciosa, |
| 7. Salix purpureo, | Salix viminalis,<br>(Basket willow) | Salix rubra, |
| 8. Salix purpureo, | Salix cinerea, | Salix pontederana, |
| 9 Salix purpureo, | Salix repens, | Salix Doniana, |
| 10. Salix viminalis, | Salix caprea, | Many hybrids, |

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* The seeds of this plant are invariably imperfect—this fact led botanists to suspect that it was a hybrid.

| | MALE PARENT. | FEMALE PARENT. | HYBRID. |
|---|---|---|---|
| 11. | Populus alba,<br>(silver leaf poplar) | Populus tremula,<br>(Aspen) | Populus canescens, |
| 12. | Rumex palustris,<br>(Dock) | Rumex obtusifolia,<br>(Broad leaved) | Rumex Steinii, |
| 13. | Inula Germanica,<br>(Elecampane) | Inula ensifolia, | Inula hybrida, |
| 14. | Carduus nutans,<br>(Thistle) | Carduus acanthoides, | |
| 15. | Cirsium arvensi,<br>(Canada Thistle) | Cirsium palustre, | Cirsium chailleti, |
| 16. | Cirsium cano, | Cirsium oleraceum, | Cirsium tataricum, |
| 17. | Hieracium præalto,<br>(Hawk weed) | Hieracium pilosella, | Hieracium bifurcum, |
| 18. | Hieracium villoso, | Hieracium murorum, | Hieracium villoso murorum, |
| 19. | Hieracium alpinum, | Hieracium murorum, | Hieracium alpino murorum, |
| 20. | Galium verum,<br>(Madderwort) | Galium mollugo, | Galium ochroleucum, |
| 21. | Mentha sylvatica,<br>(Mint) | Mentha aquatica, | Mentha nepetoides, |
| 22. | Verbascum Thapsus,<br>(Mullein) | Verbascum phlomoides, | |
| 23. | Verbascum nigra, | Verbascum austriacum, | |
| 24. | Verbascum specioso, | Verbascum orientale, | |
| 25. | Verbascum specioso, | Verbascum phœniceum, | |
| 26. | Veronica anagallis,<br>(Brooklime) | Veronica Beccagunga, | |
| 27. | Primula integrifolia,<br>(Primrose) | Primula minima, | Primula Florkenna, |
| 28. | Erysimum hieracifolium,<br>(Phlox wall-flower) | Erysimum canescens, | Erysimum virgatum, |
| 29. | Nasturtium amphibium, | Nasturtium sylvestre, | Nasturtium austriacum, |
| 30. | Rosa canina, | Rosa rubiginosa, | Rosa sepium, |
| 31, | Geum urbana,<br>(Avens) | Guem rivale, | Geum intermedium, |
| 32. | Medicago Sativum, | Medicago falcata, | Medicago media. |

Professor Gærtner, of Stuttgardt, and A. Neilreich, of Vienna, have devoted much time to the study of this subject, state that the cereals are among the plants least favorable to hybridization. Professor John Lindley, professor of Botany in the University College, London, does not regard the process by any means as impracticable, but merely difficult in manipulation—in removing the unexpanded anthers and then applying the pollen of another. Mr. Maund, of Bromsgrove, Warwickshire, (England,) obtained a prize medal at the industrial exhibition in London, in 1851, for hybrid specimens produced from the annexed varieties of wheat:

| | MALE. | FEMALE. | HYBRID. |
|---|---|---|---|
| 1. | Old Lammas, | Donna Maria, | An ear larger than either parents, |
| 2. | Pearl White, | Oxford Red, | do do do |
| 3. | Clustered Red, | Satin White, | Coarse, rough, short ear, |
| 4. | Old Lammas, | Kings' White, | Very large, long ear. |

| MALE. | FEMALE. | HYBRID. |
|---|---|---|
| 5. Boston Red, | Donna Maria, | Large ear, very strong straw, |
| 6. White Cone, (hairy,) | Northumberland Red (smooth,) | Long beardless ear, rather downy |
| 7. Dark Cone, | Pearl, | Small deformed white ear. |

Mr. Maund found as a general rule in hybridizing wheat, that a strong male and weak female produced a better result than a weak male and a strong female.

In 1848 Mr. Raynbird, of Laverstake, obtained a gold medal from the Highland (Scotland) Society, for experiments of this kind. Mr. R. commenced his experiments in 1846, with the "*Hopetoun,*" a white wheat, of long ear and straw, and fine grain, and "*Pipers Thickset,*" a coarse red wheat, with thick clustered ears, a stiff straw and very prolific, but liable to mildew. The hybrids thus obtained, were intermediate between the two parents, the ears are shorter than in the "*Hopetoun,*" and larger than in the "*Thickset.*"

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The deterioration of the saccharine qualities of the Sorgho should rather be ascribed to soil and culture than to hybridization, for the following reasons:

*First.* It is a difficult matter to hybridize plants belonging to different species although of the same genus;—in a natural state there is no probability that hybrids would be produced in any event—where hybrids are naturally produced they occur in species which are very closely allied. The different kinds of Indian corn or maize are all simply *varieties* of *one* species—hence they hybridize very readily. Indian corn and broom corn belong to the same family, (graminaceæ) yet no farmer hesitates to plant them side by side, well knowing that they will not hybridize.

*Second.* The saccharine quality of the Sorgho has deteriorated when grown in localities many miles distant from any broom corn. It is a well known fact that pollen grains are borne by the wind often for miles; but it is assuming, rather more than the facts will warrant, to assume that the wind would safely conduct pollen grains from a small lot of broom corn for a distance of many miles over hills and valleys, through forests, through many fields of corn, just as tall as the Sorgho, and then safely deposit the pollen on the pistils of the Sorgho plant.

*Third.* Every one who has grown Sorgho corroborates the fact that Sorgho grown on bottom lands, or very rich moist loam, invariably produces a very high stout stalk, but with not more than half the amount of saccharine matter in it than that grown on dry uplands. Several instances have come to my knowledge of the same lot of seed having been planted on rich bottom lands, second bottom and poor dry uplands, with the following results, viz: That planted on the first bottom grew the tallest, largest and rankest, with the most *suckers*, but required from twelve to fifteen gallons of juice to make one gallon of ordinary syrup; and the seed, planted in the same place where it grew for two or three successive years, so completely "ran out" that it produced nothing at all. That grown on the dry upland was more slender, and not near so tall, as that grown on the bottom land —but six to seven gallons of the juice made one gallon of excellent syrup. The seeds were sound, healthy, and reproduced from year to year the same kind of cane on similar soil.

*Fourth.* Almost all kinds of cultivated plants from foreign countries require acclimation—some never become acclimated—others deteriorate. Many varieties of wheat deteriorate so greatly in eight or ten years as to be no longer worthy of cultivation—other varieties, as the Mediterranean for example, improve under cultivation so as to be more valuable and reliable at the close of twenty or twenty-five years than they were originally.

# THE ATMOSPHERIC CONDITIONS SHOWING THE VALUE OF BAROMETERS FOR AGRICULTURAL PURPOSES.

BY C. A. RICHARD, OF COLUMBUS.

## CHAPTER I.

Our first subject, in demonstrating the atmospheric conditions is, to have a close examination of the *heat and moisture* which are indispensable to the fertility of the earth. Without suitable arrangements for their diffusion and distribution, and within the limits of certain minima and maxima, the earth would not have been habitable, or the design of its *Creator* perfected.

These arrangements therefore exist, and also which, in their character are very simple, though somewhat complicated and irregular in their operation, the ultimate result is always attained.

From the operation of these few, simple, connected and intelligible arrangements for the diffusion of heat and the distribution of moisture over the earth, result all the phenomena which constitute the weather; and by studying them, we may acquire an accurate knowledge of its "*Philosophy.*"

The necessary heat is produced mainly by the direct action of the sun's rays; and the most obvious feature in the arrangements for its diffusion is that which the sun is made to shine successively and alternately upon different portions of the earth. Nothing animate or organic could endure his burning rays, if they shone continuously or vertically upon one point, or could exist without their occasional presence. Hence the provision for a diurnal rotation, to prevent the exposure of any portion of the globe to the action of those rays for twenty-four consecutive hours, except for a limited period, and at a considerable angle, in the polar regions. But the earth is spheroidal, and a diurnal revolution would still leave that portion which lies under the equator too much, and the other too little, exposed to the action of the sun. This is obviated by an annual revolution of the earth around the sun, and an obliquity of its axis, by reason of which the northern and southern portions are alternately and, as far as the tropics vertically, exposed to the sun; and it is made to travel from tropic to tropic, producing summer and winter, and other important phenomena.

This obliquity and consequent change of exposure are in degree preciselv what the wants of the earth would seem to require. The direct action of the sun's rays upon the earth, particularly those portions which lie north and south of the tropics, is not the only source from which the supply of heat is derived. Although there is a general increase of heat in spring and summer when the sun travels north and of cold when he travels south in winter, yet there are frequent irregularities attending both. Very sudden and great changes occur in each of them.

Frost sometimes, cool weather often, occurs in midsummer, and considerable heat and tornadoes in midwinter. And ordinarily the maxima and minima of each month and, indeed, of each week are widely apart. Even in the polar regions, in midwinter, *where the sun does not shine at all*, the same moderating changes with which we are conversant occur in degree.

Returning to a consideration of the arrangements for the diffusion of heat, we observe: First, that the earth itself is intensely heated in its interior. This is inferred, and justly, from the fact that the thermometer is found to raise about one degree for every fifty-five feet of descent—whether in boring artesian wells, exploring caves, or sinking shafts in the mines. It is demonstrated, also, by the existence of hot springs and the action of volcanoes. Heat is supposed to be conducted from the center toward the surface every where, but with difficulty and slowly. Probably it reaches the surface and exerts an influence, also, upon the weather through the ocean, and by heating it in its greatest depths. Doubtless a portion of the warmth of the ocean here is derived from that source, and it has its influence in changing the temperature of the deep-seated cold polar currents of the great oceans. Perhaps it may yet be found that the icebergs are detached by it in the polar seas—the observation of Dr. Kane point to such a result.

Heat is also carried, and in quantities which exert very considerable influence upon the weather, from the tropics to the poles by the great oceanic currents which flow unceasingly from one to the other.

The most important of these with which we are acquaintad is the Gulf Stream of the Atlantic. Gathering in the South Atlantic, passing north through the Caribbean Sea and the Gulf of Mexico, it issues out through the Bahama Channel and flows north along the eastern coast of the United States, but some distance from it, to Newfoundland, and from thence continuing to the north-east and spreading out over the surface of the North Atlantic Ocean, but this has comparatively little influence upon the weather of the United States. Western Europe, however, Greenland, the islands which lie in its course, are most materially influenced.

A like oceanic current exists in the Pacific Ocean, the influence of which may also be traced near the north-west coast of North America. A vast amount of heat is transported from the tropical to the temperate and frozen regions of the earth by these great oceanic currents.

Another supply of heat is derived from aerial currents which flow from the tropics toward the poles. These currents exist every where over the entire surface of the earth, but in more concentrated volumes along the great lines of "*no* *variation,*" and greater magnetic intensity, on the western side of the great oceans, over the eastern portions of the two continents of North America and Asia.

Still another supply of heat, during the sudden changes, at least, is produced by the action of terrestrial magnetism and electricity. Very great progress has been made within a short period, in the investigation of the nature of these agents. The identity, or at least intimate association or connection of heat, light, electricity, and magnetism, always suspected, has been in various ways, and of a variety of experiments demonstrated. The influence of magnetism, if distinct from gravitation, is second only to that; and its agency in producing the phenomena we are considering is primary and controlling. We will only, in this connection, ask the reader to note the situation of the north magnetic poles, (for there are two of them,) which are, in fact, *poles of cold*, that is, it is colder there than even to the north of them. These poles are distinct from its geographical ones, and are situated not far from 71 deg. north latitude, and about 97 deg. west longtitude from Greenwich. We shall recur to this part of the subject again.

Such, briefly considered, are the principal arrangements by which heat is diffused over the earth.

Equally marked by infinite wisdom, and equally interesting and important are the arrangements by which moisture is distributed. Doubtless the general belief is that this is a simple process; that water evaporates and rises till it meets a colder stratum of atmosphere, and then condenses and falls again; or that currents of air of different temperatures mingle and equalize their heat, and the aggregate mass when equalized in temperature is cooler, and therefore is unable to hold as much moisture in solution as the most heated portion had, and the excess falls in rain. But the process is by no means so simple, nor is heat the sole or most powerful agent concerned in it.

Currents of air do not mingle, but stratify. Evaporation from the surface of any given portion of the earth outside of the tropics does not alone supply that portion with rain.

In this respect, take your map of North America and note its pecularities. It extends from the Isthmus of Darien to the Artic regions, and from the 65th to the 160th meridian of west longtitude from Greenwich, and has upon its surface a type of every climate in the world. For the purpose of simplifying and demonstrating the matter in hand, let us divide it into five sections. Let the first section embrace Central America and Southern Mexico, south of 28 deg.; the second, Northern Mexico and Southern New Mexico, California, etc, between the parallel of 28 degrees and 32 degrees; the third, Northern California, Utah, Southern Oregon and Western New Mexico, north of the parallel of 32 deg.; the fourth, the entire continent north of 42 deg.; and the fifth, the eastern United States, east of the meridian of 100 degrees. These divisions are not intended to be entirely accurate in their separation, but substantially so for the purpose of explaining the differences which exist in each. Now let us see in what a diverse manner, and to what a different extent, they are severally supplied with moisture.

Central America and Southern Mexico lie within the tropics—their rains are tropical rains. The season is divided into wet and dry, as are the seasons of all tropical countries which are not rainless. During the rainy season it rains a portion of nearly every day, and during the dry season the sky is clear, the air is pure, and rain seldom falls.

All around the earth within the tropics, over the land and over the sea, there is a belt of almost daily rains, varying in width, north and south, in different sections, but averaging about five hundred miles. This belt of daily rains is formed at and by the meeting of N. E. and S E. trades, and travels north and south with them, as they do with the sun, *encircling the globe* By this narrow belt a portion of the earth's surface, an average of some 35 degrees of latitude, is supplied with moisture. Wherever it is situated at any given period, the tropical rainy season exists; and when it is absent in its northern or southern transit, the dry season prevails. Southern Mexico is within the range of this moving belt, and in its course to the northward with the sun, in our summer from May to October, it arrives over, and covers that country with a rainy season. When the sun returns to the south, taking with it the trades and this belt of tropical rains, that portion of Mexico is without rain, and dry, and so continues until the rainy belt returns in the following year. While the belt is over Southern Mexico it is nearly all *precipitation*, and there is little *evaporation;* while that belt is *absent* it is all *evaporation*, with little or no *rain*. Surely this is not consistent with the prevailing belief of simple evaporation, ascent to a colder stratum, commingling, condensation and rain. Southern Mexico at least is not supplied by mere evaporation from its surface, and must therefore form an exception to that belief.

Turn now for a brief space to Northern Mexico, Southern New Mexico, and Southern California, between the parallels of 28 degrees and 32 degrees, and particularly west of the mountain ranges, we find an almost rainless region, sterile and worthless, resembling that which is found upon nearly the same parallels of north latitude in Northern Africa, Egypt, Arabia, and North-Western India; and in corresponding latitudes south of the Equator, in Peru, a portion of southern Africa, and the northern and middle portions of New Holland.

Turning now to Central and Upper California, Utah and Southern Oregon, we find still another peculiarity. Like Southern Mexico, they have a rainy and dry season, but at a different period, and for a different reason. The dry season of California, etc , is the summer of the northern hemisphere, and her rainy season the winter. *California* is therefore *dry* when *Southern Mexico* is *wet*, and *vice versa*. The belt of rains which supplies California with moisture during her rainy seasons is the belt of *extra-tropical* rains, which extends from the northern limit of the north-east trades to the poles, encircling the earth. The southern edge of this extra-tropical belt is *carried up* on the western coast of America, and in that portion of the continent *in summer*, when the sun and trades, and the inter-tropical rainy belt travel to the north, and uncover California, etc., leaving them without rain for a period of about six months.

As the sun, with the trades, travels south, the southern edge of the belt of extra-tropical rain follows, and covers California, etc., again extending gradually from the north to the south, and thus their wet season returns. The belts of rains which cover Mexico, Utah, New Mexico and California in summer and winter, are entirely distinct and different in character.

Here again in this section of the continent, as in Mexico, evaporation is going on for six months of the year, and were it not for the return of the belt of rains from the north, in the fall, would go on for the entire year without precipitation; and for the other six months precipitation is vastly in excess. It is however obvious that evaporation alone, great or long continued, will not furnish the evaporating section with rain.

Coming to the portion of the continent which we occupy, the 5th section, we find it different still—a most favored region. Portions of it—Eastern Texas, for instance—are upon the parallels of latitude as the rainless regions of Northern Mexico, etc. Eastern Texas, however, is not rainless Other portions are upon the same parallels as California, etc., yet have no distinct rainy and dry season. We repeat, this section is a most favored region—without a parallel upon any portion of the earth's surface, except in China and some other portion of Eastern Asia.

It is not only without a distinct rainy and dry, but it is watered by an average, annually, of more than forty inches of rain, while Europe, although bounded on three sides by seas and oceans, and apparently much more favorably situated, receives annually on an average of only about twenty-five—if we except Norway, and one or two other places, where the fall of rain is excessive. The distribution of this supply of moisture over the United States is, in other respects, wonderful. Iowa, in the interior of the continent, far away from the great oceans, on the east or west, or the Gulf of Mexico on the south, receives fifty inches and the average over the entire great interior valley is about forty inches falling at all seasons of the year.

And now, what is the explanation of all this? What produces the extra-tropical belt of regular rains surrounding the earth, north of the parallel 30 degrees, in some places, and 35 degrees in others, extending to the pole, with its southern edge traveling up 10 or more degrees in summer, leaving large portions of the earth subject to a dry season; and back again in winter to give them a rainy one? What produces the narrow belt of intertropical rains encircling the earth; traveling up and down every year over an average of 35 degrees of latitude, supplying every portion of it alternately with rain? And what connects the two together over the eastern portion of North America, so as to leave no distinctly marked wet and dry season, and no rainless and sterile portion there? Are all these the result of simple evaporation, ascent to a colder region, condensation, and descent again? Demonstrably not. Of the forty inches which fall annually upon the middle and eastern portions of the United States, an average probably of one-half or twenty inches runs off by the rivers to the ocean, or is carried away by the westerly or north-westerly evaporating winds. The same is true, in degree, of the rain which falls upon the other portions. Evaporation, therefore, could not keep up the supply. From whence, then, does it come this twenty inches, thus lost by the rivers and winds, and with such wonderful regularity every year?

"All the rivers run into the sea, yet the sea is not full. *Note the place whence the rivers come, hither they return again.*"

But how is it that they thus return with such wonderful regularity, in a narrow traveling belt of daily rains within the tropics, and a movable belt of irregular rains without the tropics, extending to the poles, leaving a space on each side of the equator encircling the earth in like manner (except at two points, *viz.*, Eastern Asia and Eastern North America), from which they do not go, and to which they do not return, and which is almost entirely unfurnished with rain? And all this without any relation, whatever, to the work of mere evaporation, or of the accidental or irregular commingling of winds with different dew points, or quantities of moisture in solution, or accidental, irregular changes of barometric pressure. *It is one vast, wonderful, connected and regular system—co-extensive with the globe—necessary to the return of moisture from the oceans upon the most inconsiderable portion of it, and to the condensation of the moisture of evaporation; and by it the waters are returned from the oceans as regularly and bountifully upon the far interior of the great continents, in the same latitudes, as upon the "isles which rest in their bosoms."*

## CHAPTER II.

Our rivers return in the form of clouds, and in storms and showers, although, in truth, they return in regular, uniform, ordinarily invisible currents, and the storms and showers are but condensations in and discharges from portions of those currents, aided by the local moisture of evaporation.

These *storms** extend over a considerable surface, rarely less than 100 miles in one direction or another, and sometimes 1500 or more. Distinct showers cover but a small surface, sometimes not more than 40 to 100 rods, as in the tornado, and rarely more than 10 miles Belts of showers, each new one forming a little more to the south, often, in summer, pass across the country, following each other in succession; and these belts may be of considerable width, say 30 to 150 miles.

The clouds which constitute the storms and showers differ in appearance and character, as well in the active as in the forming state. Clouds are of distinct characters, alike, substantially, everywhere under like circumstances; and a distinct nomenclature has been applied to them by Dr. Howard, of London. He notes three kinds of primary clouds, viz: *Cirrus, Stratus,* and *Cumulus;* and inasmuch as the boundary line between them is not very distinct, certain compounds of the three, viz: *cirro-stratus, cirro-cumulus,* and *cumulo-stratus.* This nomenclature is everywhere received, and portions of it are of great practical importance.

The three principal descriptions of cloud, viz: the cirrus, the stratus, and the cumulus, we have very much as they have in Europe, and doubtless as they exist everywhere outside of the tropics.

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* What we call storms denote regular rains.

Before describing them, it may be well to look at a form of clouds which are generally called storm scud. These are, practically, very important forms of cloud condensation. They are patches of foggy seeming clouds, of all sizes, more or less connected together by their portions of similar condensation, often passing to the westward, south-westward, north-westward, or northward, with great rapidity. Their average height is about half a mile, but they often run much lower. They are usually of an "*ashy gray*" color.

The *cumulus*, next in order, one mile from the earth, is the principal cloud of the tropics, and is not often seen with us except in summer, or when our weather is tropical in character.

In summer, when the air is calm, the weather warm, and no storm is approaching, there is always, in the day time, a tendency to the formation of cumuli. This tendency exhibits itself about ten o'clock in the forenoon, and they gradually form and enlarge until about two in the afternoon; and after that, if they do not continue to enlarge and form showers, they melt away and disappear before nightfall. Sometimes, in July and August, the atmosphere will be studded with them at mid-day, float about three-fourths of a mile from the earth, gently and slowly away to the eastward. At times it may seem as if they must coalesce and form showers, yet they frequently do not, but gradually melt away, as before stated. They also appear in isolated clouds of every size, or in vast clouds composed of aggregated masses, as the peculiar cloud of the thunder shower. They form as low down as the scud or fair weather cloud of the N. W. wind; and often in violent showers, and particularly in hail storms, extend up as far as the density of the atmosphere will permit them to form.

The last in order occupying the higher portions of the atmosphere, are the *cirrus* and *stratus*. The cirrus is often the skeleton of the other, and precedes it in formation.

These are the proper clouds of the storm. While, however, the cirrus remains a cirrus, it furnishes no rain. When it extends and expands, and its threads widen and coalesce into *cirro-stratus*, or it induces a layer of stratus below it, the rain forms. The cirrus clouds have the least density, therefore the greatest elevation is about four miles from the earth, and also the greatest variety of extent and direction. They are the earliest appearance after serene weather. They are first indicated by a few threads penciled, as it were, on the sky. These increase in length, and new ones are in the meantime added to them.

The *stratus*, about one mile and a half from the earth, is a smooth, uniform cloud—the true rain cloud of the storm; often forming without much cirrus above, or connected with it. It may be seen in its partially formed state in the bank in the west, at nightfall, or in the circle around the moon in the night. When it becomes sufficiently condensed, rain always falls from it, but in moderation. If there be large masses of scud running beneath it for its drops to fall through (especially as is sometimes the case, in two or more currents), the rain is very heavy.

Intermediate between the fibrous, tufted cirrus, and the smooth uniform stratus, there is a variety of forms partaking more or less of the character of one or the other, and termed *cirro-stratus.*

The cirro cumulus is a collection of patches of very small distinct heaps of white clouds; they are called fleecy clouds, from their resemblance to a collection of fleeces of wool. They do not appear often, and are usually *fair-weather clouds.* The cumulo stratus is seldom seen in our climate. Stratus condensation *above,* and in connection with cumulus condensation, is not uncommon.

## CHAPTER III.

Having thus taken a brief view of the different clouds, let us return to the inquiry from what ocean, and in what manner, *our* "rivers return."

Not wholly or mainly from the North Atlantic, although it lies adjacent to us, as they often seem to do so; for, first, all storms, showers and clouds which furnish, *independently,* any appreciable quantity of rain to the United States, and even adjacent to the Atlantic, or indeed to the Atlantic itself, come from a westerly point, and pass to the eastward. *This is a general, uniform and invariable law, although there is in different places and in the same place at different times, some variation in their direction.*

But do we not see, you inquire, that when it rains, the wind is from the eastward, and that the *clouds* follow the wind from the east to the west? You do indeed, generally, in all considerable storms, observe that the wind blows from some easterly point, and that *seeming* clouds are blown by it to the westward; but what you see and call clouds are not the clouds which furnish the rain. For above the seeming clouds you notice, directly over your head when it rains or snows, are the rain or snow clouds, dense and dark, passing to the eastward, how strong soever the wind may blow from the quarter to which they tend, or any other quarter, between you and them. What you see below them are *scud.* They are thin, and the sun shines through them, although with some difficulty, when the rain clouds above are absent or broken.

If you could see a section of the storm, you would see the rain cloud above, and moving to the east, and scud beneath running to the west. Opportunities frequently occur when these appearances may be seen. Storms are sometimes very long, a thousand miles perhaps, from S. W. to N. E., and not more than one to three hundred miles wide from S. E. to N. W., and their sides, particularly the northern ones, are regular, and without extensive partial condensation.

Again, thunder storms, we know, come from the westward, and apparently against an east wind. It is sometimes said they approach from the east, but it is a mistake. They sometimes *form* over us, or just east of us, or one may form at the east and another at the west, and as they *spread out in forming*, one may seem to be coming from the east, or there may be an easterly current, with dense flocculent scud at the under surface of the shower cloud running westward, but they finally pass off to the eastward, and never to the westward.

Thunder and lightning sometimes attend portions of regular storms in spring and autumn, but the thunder is always heard first in the west, and last in the east.

Again, there are admitted facts with which you are conversant, which prove this proposition. When it has been raining all day, and just at night the storm has nearly all passed over to the eastward, and the sun shines under the western edge of it, and "*sets clear*," as it is termed, you say that "*it will be clear the next day*." Why? Because the storm will not pass to the westward, covering the sun and continuing. how strong soever the wind may be from the east; and because it is passing and will continue to pass off to the eastward, leaving the sky clear. *The easterly wind will stop as soon as the storm clouds have passed, and it will fall calm, or the wind will "come out" from the westward.*

So, too, when the clouds are dark in the west in the morning, and the sun rises clear, but "*goes into a cloud*," as it is expressed, you say that it will rain. And if the clouds are dense this generally proves true, because there is a storm or shower approaching from the west and passing to the east, the western edge of whose advance condensation has met the sun in his coming, and obscured him from your vision.

When, too, it has been storming, and lights up in the N. W., you say it will clear off; the N. W. wind will blow all the clouds away. It is, indeed, generally true that when it so lights up it is about to clear off, although it sometimes shuts down again, in consequence of the approach of another storm from the westward, following closely behind the one which is passing off. It is a great mistake, however, to suppose the N. W. wind blows away the clouds. Watch the smooth stratus rain cloud at its lower edge, where the clear sky is seen, and you will see that it is moving on steadily to the N. E., in obedience to the laws of its current, and will do so, even when its retreating edge has passed up to the zenith, and down to the S. E.

The storm uncovers us from the N. W. by the contraction of its width, or because it has a *southern lateral extension* and *dissolution*, and not by being blown away by the N. W wind, although that wind, by its peculiar fair weather clouds, may be, perhaps, observed beneath, ready to follow its retreating edge.

Again, when it has been clear all day, and the sun sets in a bank of cloud, you say, "*it will rain to-morrow, the sun did not set clear*," and unless that bank is a thunder cloud merely, which will pass over or by you, with or without rain, before morning, it is generally true that it will. The bank will prove the eastern edge of an approaching storm.

From these generally admitted and understood facts, you may know that storms pass from the west to the east.

This proposition is also proved by all investigations of storms which have taken place since the settlement of this country. Storms of great severity attract particular attention, and are said to "*back up*" against the wind, because they are observed to commence storming first at the westward, although the wind is from the eastward. Doubtless you recollect many such instances recorded in the newspapers; then no season occurs without such notices.

There is a current in the atmosphere, all over the continent north of the N. E. trades, but in great volume over the United States, east of the meridian of 105 deg. W. from Greenwich, varying in different seasons and upon different parallels, and flowing near the earth, when no surface wind interposes between them.

The usual course of this current is from about S. W. to N. E., varying somewhat according to the season, and in other sections varies in obedience to the general law of its origin and progress.

*This current comes from the South Atlantic Ocean.* It is our portion of the aerial current which flows every where from the tropics toward the poles. *It brings to us the twenty inches of rain which we lose annually by the rivers, and by the westerly winds which carry off a portion of the local moisture of evaporation, and its action precipitates the remaining portion of that moisture. It spreads out over the face of our country with considerable but not entire uniformity. All our great storms and all our showers originate in it, or are induced and controlled by it.*

Now let us go down to the intertropical regions, of which we have said something in connection with a notice of Southern Mexico, and see where and how this great aerial current originates.

## CHAPTER IV.

We find the trade-wind region between the parallels 35 degrees north latitude and 35 degrees south latitude—changing its location within this limit at different seasons of the year—encircling the earth and covering about one-half of its area. In this region are the simple and uniform arrangements which extend every where and produce all the atmospheric phenomena. In the center of it we find that movable belt of continual or daily rains and comparative calms, particularly *near its center*, about four hundred miles in width. This belt of rains and calms follows the trades and sun, in their transit north and south, from one tropic to the other—its width and extension depending upon the volume of trade-winds existing on the sides of it. It travels from south to north over from 25 to 40 degrees of latitude. The presence of this belt of rains over any given portion of the inter-tropics gives that portion its rainy season, and its absence, as it moves to the north or the south, gives the portion from which it has moved its dry season. It passes in its transit twice each year over some portions of the country, and therefore two corresponding rainy and dry seasons result.

At the northern edge of this movable belt of rain the trade-winds prevail, blowing toward and into it from the N. E.; and at the south line of this belt of rain the trades blow toward and into it from the S. E. Of course the northern limit of the N. E trades travels north and south with the belt of rain toward which it blows, and so the southern limit of the S E. trades, in like manner with the rainy belt, or rather, to speak with more accuracy, the belt of rain, moves with the trades and the trades follow the verticality of the sun.

At the northern and southern limits of the trade-winds, and extending from them to the poles, are found the variable winds and irregular extra-tropical rains all over the earth. The line of extra-tropical rains descend to the south, following the retreating trades as they descend in our winter, and recedes north before the trades when they return in spring and summer; so that at the outer limit of the trades, respectively toward the poles, the line of extra-tropical rains will be found receding or following that limit as the trades pass up and down with the sun. From the north pole to the northern limit of the N. E. trade-winds, whereever found, whether at 38 degrees north latitude, as in some places in summer when the sun is at the tropic of Capricorn, the extra-tropical rains prevail. A state of things precisely similar exists between the south pole and the southern limit of the S. E. trades.

Such are the *main* phenomena, *at the surface*, in the trade-wind region. Ascending a step higher in the atmosphere we find above the surface-trades a counter-trade running, not in the opposite direction, but at right angles or nearly so. The counter-trade, which issues from the northern side of the rainy belt, running to the N. W., and the counter-trade, which issues from the southern side, running to the S. W., varying as the trades do in direction in different localities. These counter-trades are continuations of the surface-trades, which, ascending in their course, have threaded their way through the opposite trade in the rainy belt, and are continuing on at the same angle and in the same direction at which they blew upon the surface, and in obedience to the same law. This is apparent from several considerations.

1st. They issue at the same angle and over the top of the surface-trades.

2d. We cannot suppose the N. E. trade to be reflected and turn back over itself at a right angle. That would be impossible, even if there were a wall of sold material there for it to blow against. Air is a peculiar fluid, and it stratifies with astonishing ease. He who supposes that a current of air put in motion can be turned aside by another current, or by the atmosphere at rest, or can be made to mingle, is mistaken. It will stratify and force itself onward through the adjacent and opposing atmosphere and in a right line.

3d. The cause which operates to produce the surface-trades still operates upon the current of carrying it over into the other hemisphere—a counter-trade, as we shall see. It is impossible, therefore, to believe that the surface-trades, as they arrive at the belt of rains and calms, turn at a right angle, or at any angle, and return; and impossible to doubt that they pass through each other in this belt and out at the opposite side, as upper currents, at the same angle at which they entered. Of course the N. E. trade of the Atlantic becomes the N. E. counter-trade of South America, carrying their storms in a S. W. direction, and the S. E. trade of the Atlantic the S. E. counter-trade of the West Indies, carrying all their storms in a N. W. direction; and what is true of them is true of trade-winds *every where, all over the globe, over the land and over the sea.*

Doubtless here some one will say our upper current is a S. W. current. True the S. E. trade, which enters the belt of rains and issues out on the north a S. E. upper current or counter-trade, keeps that course until it arrives at the northern limit of the surface trade, when, *in obedience to another law,* it gradually *descends near the surface, curves to the eastward,* and becomes *the S. W. current which passes over us.* And so we have the S. E. trade-wind of the South Atlantic with its moisture, warmth, electricity and polarity over and perhaps sometimes around us, dropping the electric rain which makes glad our fields; giving us, when not prevented by other conditions, the balmy air of spring, the Indian summer of autumn, and the mild mitigating changes of winter; and thus *our rivers, which run into the sea, return to us again.*

But let us go back to the trade-wind region—the region of regularity and uniformity—and examine somewhat more attentively its features, that we may more fully understand the character of this counter-trade.

There are, however some *apparent* anomalies which deserve attention. Here are more distinctly marked the *rainy* and *dry seasons* existing side by side. Here are the *rainless portions* of the earth already but briefly alluded to; here the *monsoons* and another peculiarity, viz: the *gathering of the counter-trades* upon the western sides of the two great oceans into two *aerial currents of volume, analagous* somewhat to the two *gulf streams* of the oceans. Lut us examine these anomalies.

The rainy and dry seasons depend, as we have seen, upon the transit north and south of the rainy belt of comparative calms. Wherever this belt may happen on any given day to be situated it is dry, the earth is parched, and vegetation withers.

Again within this trade-wind region are the *rainless countries.* These are portions of the earth which the equatorial rainy belt does not ascend far enough north in summer to cover, nor does the southern edge of the extra-tropical regular rains descend in winter far enough south to cover them, and where, of course, rain seldom if ever falls. Such are the central parts of the Desert of Sahara, Egypt, Arabia and some other portions to the north of the equator; and a similar state of things exists south of the equator, in parts of South America, Africa and New Holland, although upon a comparatively small surface.

Again, another anomaly is the gathering of the trade-winds into great volumes on the westerly side of the great oceans, and the consequent carrying of the equatorial rainy belt up to the region of extra-tropical rains, on the eastern side of the great continents of Asia and North America, and the peculiar liability of these aerial gulfs to hurricanes and typhoons. Such an aerial gulf gathers over the Caribbean Sea and the West Indies. Passing across the Gulf of Mexico it enters over Texas and Louisiana and the other southern states—its western edge passing north in autumn and winter on the eastern side of the highlands of Western Texas, New Mexico and the Great Desert—curving, as all counter-trades do, to the eastward as soon as it passes the limit of the N. E. trades, and spreading out over our favored country, leaving the evidence of its pathway in the greater quantities of rain which fall annually upon its surface. This gathering deprives a portion of the Atlantic, north of the tropics, of its share of the counter-trade; and there, as every where, where the volume of counter-trade is small, storms and gales are infrequent, and of less force, and comparative calms prevail.

A like gathering, in volume, of the S. E. trade, on the western side of the Pacific, enters over Asia, and covers China and Malaysia, extending, in its western course, nearly as far as the western edge of Hindoostan. In this concentrated volume of counter-trade, and owing to its concentrated action form and float the typhoons of the China Sea; and to this anomalous earial gulf stream the S. E. portions of Asia, from the western desert of Hindoostan to the eastern portion of China, north of the rainy belt, owe their great supply of moisture and fertility, and their peculiar climate.

Another anomaly which we find in the trade-wind region is the monsoon. There are several of them, but they are found in the greatest strength and regularity in the Indian Ocean.

Now, I ask, upon *what cause* do these great central phenomena, so vast, so regular, so wonderful, depend? What is the *motive power* of this connected atmospheric machinery, whose action and influence extends over the entire globe?

"*Heat, heat,*" with a decidedly upward tendency, is the great theory of meteorologists by which they attempt to account for the various atmospherical disturbances of both tropical and extra-tropical regions.

But away with all these theories and let us seek some agent whose *power* and *adaptation* correspond with the *extent, simplicity* and *magnificence* of the phenomena, and, in some degree, with the *power* and *wisdom* of *their Author.*

## CHAPTER V.

We ask, is there such an agent, that will combine the moisture of evaporation with the air, so that the cold atmosphere through which it passes may not be *continually condensing its moisture,* and thereby *enveloping the earth in a perpetual mist;* but so that it may part with it at *intervals,* making *cloudy* and *clear days;* and part with it in *portions,* so that a *regular* and *necessary supply* may be furnished to the *entire hemisphere,* even up to the geopraphical poles? There is, precisely and perfectly adapted to the ends to be attained, an ever active agent, and that agent is *magnetism;* because the earth has its magnetic poles, which are distinct from its geographical ones; and there are two in each hemisphere. Those two in the northern hemisphere are situated in 71 deg. north latitude, and not far from longitude 97 deg. W., and the other about 114 deg. E. from Greenwich. Navigators have gone north and north-west of it, and found its situation by the declination of the needle in the compass. From these poles, lines of magnetic intensity extend to the opposite and corresponding pole of the other hemisphere, and upon or near those lines the needle points north without variation; and towards these lines of no variation, the needle everywhere, on either side, declines.

Recent discoveries have shown that the magnetic force is exerted in lines and currents; that such currents, as physical lines of force, surround magnets and currents of electricity. Doubtless such lines of force exist around the earth and the magnetic poles. There are also *longitudinal* lines of force existing and active between the poles, and extending from one side of the center to the other, occupying nearly one-third of the magnet. If you take a large needle, thoroughly magnetized, place it upon paper, and drop filings of iron upon it, they will become arranged about it in circular and perpendicular, and, also, in *longitudinal lines*, conforming to the currents.

The lines shown upon the needle should bear the same proportion to its length as the trade-winds bear to that of the earth, measured from pole to pole, and if the needle had a globular form they would so appear.

These lines are made by currents arising from one side of the magnetic equator, and passing over to the other. Doubtless just such currents rise, and pass over upon the earth.

Magnetic and electric currents carry the air with them. This is well settled by experiment. *Oxygen*, too, is *magnetic*, and capable both of receiving and retaining polarity, and combining with, or attracting and retaining vapor, and, of course, the moisture of evaporation. Here then we have a power existing capable of producing the result—precisely, and with evident wisdom, adapted to its production—ever present and active, and no other known agent can.

Now let us look a little further. This result is affected by the action of the sun; the trades with the central belts of rains travel north and south after it; so does the sun affect the magnetic currents everywhere; even the magnetic needle is daily affected by its action, as it increases the intensity of the terrestrial magnetic currents, and hence its well established diurnal oscillations.

Again, along the eastern lines of the continents which skirt the great oceans on the west, run the northerly and southerly lines of no variation, and of greatest magnectic intensity. Here are the trade currents gathered into a volume, which curve and carry unusual fertility to South-eastern Asia and North America, and in those great aerial gulf streams we find the *intense* electric action which produces the typhoons of the former, and the hurricanes of the latter. It may still be said that these conditions and phenomena of the trade-wind region are not produced by magnetism or magneto-electricity, *but the objector can point to no other adequate power*. That it must be heat, electricity, or magnetism, must be admitted; because there is no other power known. Heat demonstrably can not produce them.

There is one peculiarity, to be more particularly noticed, before we leave the trade-wind region, viz:

The belt of rains, formed by the currents of the two trades, threading their way through each other—how are they produced? Why should the place where the currents pass through each other be a place of almost daily precipitation? There is, in fact, no ascension, except that which the currents have in their lines of ascent to attain the elevation which the magnetic law of the current requires.

The trades have passed over an evaporating surface, and are charged with moisture. This moisture they hold in magneto-electric combination. *Evaporation* does not depend upon *temperature.* Ice and snow evaporate at all temperatures. So the cold north-west wind, full of positive electricity, will lap up, as it were, the pools from the earth, with astonishing quickness; and when this electricity is deranging the action of the machinery and material of the manufacturer, he allays it by a supply of moisture, when below the freezing point. In all parts of the atmosphere, as at the surface of the earth in winter, moisture is held in large quantities in the coldest and severest weather; and it is not till it moderates, and a perceptible *electric* change takes place, that it is precipitated as rain or snow. Doubtless there is an exposure of considerable surfaces, of opposite currents, charged with opposite polarity, and a constant depolarization where their surfaces meet. May there not be a consequent dissolution of the electro-magnetic combination between the air andmoisture, or the exitation of that electric action which attends or produces like rains everywhere? and hence the constant precipitation. This is rendered probable, by the fact that precipitation, at the meeting of the trades, takes place in level countries in the day-time, between 10 A. M. and sunset, in showers, with thunder and lightning, as with us in summer, although among the mountains the rain sometimes falls in the night. The precipitation in the heat of the day is obviously induced by the action of the sun, occurring at a time of day when the sun is affecting the magnetic currents most powerfully, viz., between 10 o'clock A. M. and sunset, and mainly at the time of the greatest heat.

The counter-trades *do not precipitate* after they leave the rainy belt, although at a great elevation, until they reach the outward limits of the trades; and they *do precipitate again,* although they gradually descend *nearer the earth,* as soon as they become subject to the action of the currents of an opposite magnetism. Their precipitation is partial too, even then, and they carry a portion of their moisture through an atmosphere of the coldest temperature up to the geographical poles.

A similar result attends the action of the sun in the extra-tropical regions. Cumuli commence forming in the counter-trade, or at a line between that and the surface current, at the same time of day that the diurnal motion of the magnetic needle commences, or the rain clouds form in the tropics; they continue to enlarge here as there, till about the same hour of the day that the *needle* obtains its maximum diurnal variations; and when the influence of the sun upon the needle ceases, and it returns to its original state, the cumuli disappear.

In like manner the sea-breezes, and other fair weather surface winds, rise in the forenoon with the influence of the sun upon the magnetic currents and the needle, and die away at night-fall when the influence ceases.

Such, then, are the atmospheric arrangements and phenomena of the trade-wind region, and the cause that produces them; such is the character and cause of the enlarged volume of counter-trade, which spreads out and blows over our country as permanently as the south-east trades blow on the South Atlantic and South America, returning to us the rivers which had run from us to the sea.

## CHAPTER VI.

Here is one peculiarity to be more particularly noticed, viz, to understand the precise character of the reciprocal action which takes place between the earth and the counter-trade, and produces the varied phenomena which mark our climate. We have seen that the same laws—other things being equal—operate everywhere, and that analogies may be sought in the character of those phenomena elsewhere, under the same, or different, modifying circumstances. Looking, therefore, at the magneto-electric movable machinery as a whole, and its influence upon the atmospheric conditions, we find many facts which point to a primary action in the counter-trade, and others that point as significantly to a primary local inducing-action in the earth. Let us briefly review those to which we have alluded, and advert to some others, and see what solution of the question they will justify.

The belt of inter-tropical rains appears to be, in width, and amount of precipitation, and annual travel north and south, proportionate to the volume of trades which blow into it, the quantity of moisture they contain, and the elevation of the surface over which they meet.

South America is the most thoroughly-watered country within the tropics, except, perhaps, portions of Hindoostan, Burmah, Siam, etc., on south-eastern Asia. The contrast between both, and Africa, as far as explored, and as shown by its rivers, is most obvious. The Amazon, alone, delivers more water to the ocean than all the rivers of Africa.

Of the width of the belt of rains over Africa, in the interior, we know little. Its northern extension is less, by from seven to ten degrees, than the same belt over South America, the West Indies, and Mexico. Probably its southern is also. Upon South America, the southern edge is carried down to Cochabamba, in latitude 18 deg., and probably to 25 deg., to the northern edge of the coast-desert of Peru, while it is rarely, if ever, found over the Atlantic below 7 deg., a difference of 12 to 20 degrees. Over South America, too, the quantity of water which falls is also vastly in excess of that which falls upon the Atlantic. The main cause of these differences is obvious. The north-east counter-trades which blows over Africa, originate on a surface which is rainless, as eastern Sahara, Egypt, Arabia, etc., or subject to a dry season by the northern ascent of the southern line of the extra-tropical belt, as the Barbary States, Syria, Persia, etc, and their supply of moisture is necessarily scanty. On the south the south-east trades originate, in part, upon the eastern portion of southern Africa, and, in part, upon the Indian Ocean, and from the latter source, and a portion of the Mediterranean, doubtless most of the water which falls upon Central Africa, is derived.

The north-east and south-east trades which blow into the inter-tropical belt upon the eastern portion of the Atlantic, originate upon similar surfaces, and with like effect. Thus, the south-east trades, in summer, are from the southern portion of Africa, and the north-east, in part from the Mediterranean; and, in winter, the north-east from the deserts, Senegambia, Nigritia, etc., and the south-east, owing to the narrowing of the African continent, mainly from the South Atlantic and Indian Oceans. Going west, the belt widens, and its range increases until the Andes are reached; but under their lee, on the western side, a totally different state of things is found, and the belt of the coast becomes broken and irregular.

The width, extension, and excessive precipitation of the belt, over South America, follow the same law. The South Atlantic widens out by the trending of the coast to the south-west, and furnishes a large area for the unobstructed formation and evaporative action of the south-east trades. So the trending of the coast to the north-west, from 5 deg. south to the northward, opens a large area for a like formation and action of the north-east trades. No correspondingly favorable circumstances exist anywhere, except, perhaps, around Hindoostan, and there the fall of rain is very excessive in some places, as on the Kassaya hills, to the extent of 400 inches per annum. In addition to this, the magnetic line of no variation, and of greater intensity, which runs from our magnetic pole, obliquely, south-east, to its opposite and corresponding pole in the southern hemisphere, enters the Atlantic in the coast of North Carolina, and traverses it and the eastern portion of South America, through the whole trade-wind region. The table-lands, and slopes, and high mountain peaks, meet the trades successively, as they go west, and the latter wrench from them, to an annual extent, their moisture; depressing the line of perpetual snow, by an increase of quantity on the eastern sides, several thousand feet, as it is for a like cause depressed on the southern side of the Himmalayas. On the eastern slopes and tops of the Andes, as we have seen, and owing to their elevation, falls the moisture which, according to the working of the machinery, and the law of curvature, should bless the coast line of Peru and northern Chili, the eastern Pacific, northern Mexico, California, Utah and New Mexico; and, while the Andes stand, the curse of comparative aridity must rest upon them all.

Southern Chili and western Patagonia are supplied by the north-east trades, which originate in the West Indies, the Gulf of Mexico, and the Caribbean Sea, and the Pacific, off Central America, in the neighborhood of the Bay of Panama. But there, again, the same effect of elevation is seen. The mountain slopes of southern Chili and Patagonia, are abundantly supplied, and their mountain ranges are drenched with rain, while eastern Patagonia and southern Buenos Ayres, under their lee are comparatively dry. So the south-east trades, which originate off the western coast of South America, curve in upon, and aided by the oceanic currents, supply abundantly, the north-west coast of our continent, north of California; and there, too, the coast, and its elevated ranges, receive, as we have seen, a very large proportionate supply of their moisture. Substantially, the same state of things, as far as circumstances permit, is reproduced upon Malaysia, Hindoostan, etc., and the interposition of arid New Holland upon the evaporating trade-surface may be distinctly traced upon south-western Asia. Deserts abound there; the Caspian Sea receives the drainage of a very large surface, without an outlet; their southern line of extra-tropical rains is carried up very far in summer, and their dry season is intensely hot.

Another fact in this connection is worthy of a moment's consideration. The magnetic equator, as sought by the dipping needle, is not coincident with the geographical one. Humboldt found it on the Andes, at 7 deg 1 min. south, and it has been found still lower in the At lantic. Over Africa it rises above the geographical equator, and descends again on the Indian Ocean. About midway the Pacific, it becomes coincident with the equator of the earth again. Perhaps it is not known, with certainty, why this is so. The south pole may be situated nearer the geographical pole than the north one—but this is not believed to be so, nor could it make the difference. The greatest southern depression of the magnetic equator is found where the lines of greatest intensity, and of no variation, are found; and at the more intense of these lines exists the greatest depression. From this, I think, it may be inferred that the needle is affected by the greater magnetic intensity of the northern hemisphere, to which it may yet appear the obliquity of the earth's axis is owing. However this may be, or whatever the cause, no marked effect is produced upon the trades. The south-east trades, by reason of the greater extent of ocean surface on which they originate, are everywhere the most extensive, regular and forcible. The south polar waters, from which they rise, are everywhere trenching upon and over-riding the north polar ones; and thus, by a most beneficent provision, the greater portion of the habitable surface is placed in the northern hemisphere, and the principal portion of the southern is left open to an extensive, active evaporating action, which supplies the northern habitable surface with a large excess of the needed moisture.

The condensation, and consequent precipitation which, at the passing of the trades over the ocean and lowlands, takes place mainly in the day-time. Upon the table-lands and mountain-ranges, it often continues during the evening and night. The morning, and early part of the day, however, in tropical countries, are generally fair at all elevations.

Storms also originate in the equatorial belt, and, issuing forth in great volume and with great intensity of action, find their way up even within the Arctic circle. Those which pass over this continent, or the northern Atlantic, generally originate in the West Indies, some of them over the Caribbean Sea, some over the islands, and some over the open ocean to the east of them; and nearly all the most violent, during the months of August, September and October. It would seem most probable that the primary action in such cases was in the trades themselves, but it is by no means certain that such is the case. They occur, too, at the time when the whole machinery of distribution has reversed its course, and is rapidly pursuing its journey south. It is a period of great magnetic disturbance, over both land and sea; of more active gales and local increased precipitation. At the Magnetic Observatory of Toronto, Canada West, these disturbances are carefully and systematically observed, and their maxima, or periods of greatest disturbance, occur in April and September. (See Silliman's Journal, new series, vol. xvii., p. 145.)

The tendency to volcanic action is not as great at the autumnal as at the vernal equinox, for the reason that most of the volcanic action of the western hemisphere develops itself now upon South rather than North America. But both exist, and are active, and what are improperly termed equinoctial storms, and gales and rains are proverbial during, or just subsequent to, both periods with us—as they are when the same change, called the breaking up of the monsoons, takes place in the line of magnetic intensity, over southern and eastern Asia.

The following extract will show the most remarkable coincidence between violent volcanic action and great atmospheric disturbance. Perhaps the increased fall of rain at and after the equinoxes, in the northern hemisphere, and in certain localities subject to volcanic activity, is as strikingly illustrated, by the register of Mr. Johnson, on the volcanic island of Kauai, one of the Hawaiian group; there the greatest fall of rain, in any month, except April and October, was eight inches. In April, the fall was fourteen inches, in October, eighteen inches. Neither the equatorial, nor extra-tropical belt, were over the island during those months; but they were the north-east trades, and the result was owing solely to the interposition of high volcanic mountains *in a state of disturbance*, into, or near the strata of the counter-trade.

The peculiar stormy state of the atmosphere over the Gulf Stream, certainly affords no evidence of primary atmospheric action. It is a body of south polar water, pursuing its way under the guidance of magnetism—maintaining its polarity by the outward pressure of a cold north polar current which it has met to the east of the Banks of Newfoundland, and forced to take an in-shore course to the southward, and the bodies of water which the rivers discharge, and a conflict with the north polar surface-winds which sweep over it, and fogs, thunder and rain, are a matter of course Dr. Kane met a portion of this singular current in Baffin's Bay, north of 75 deg., which had preserved its characteristics and a considerable proportionate excess of heat, although it probably had been around Greenland, or found its way to the west, toward the magnetic pole, through some of its northern straits. (Grinnel Expedition, p. 120.)

The investigations of Lieut. Maury show, that when the Gulf Stream turns to the eastward, crossing the lines of declination at right angles, as the counter-trades also do in the same latitude, it is *carried up, in summer, several degrees to the north*, and descends again in winter—thus demonstrating its connection with the shifting magnetic machinery which controls alike the ocean, the atmosphere, and the temperature of the earth.

There are other irregularities which deserve to be noticed, in this connection, although the anological evidence they afford is far from being decisive.

I have observed, that alternating lines of heat and cold, as well as rain and drought, existed frequently, without regard to latitude, following, to some extent, the course of the counter-trade. Such lines have been observed by others.

Thus, Mr. Espy, after describing a snow-storm, which was followed by a very cold north-west wind, of several days' continuance, says:

"This cold air covered the whole country, from Michigan to the eastern coast of the United States, till the beginning of the great storm of the 26th of January; and, what is worthy of particular notice is, that the temperature began to increase first in the north and north-west. On the morning of the 25th, in the north-western parts of Pennsylvania, and northern parts of New York, the thermometer had already risen in some places 30 degrees, and in others, above 40 degrees. While in the south-east corner of Pennsylvania and in the south-east corner of New York it had not begun to rise. The wind also began to change from the north-west to south and south-east, first in the north-west parts of Pennsylvania and New York, some time before it commenced in the south-east of those States; and during the whole of the 25th, the thermometer, in the north of New York, continued to rise, though the wind was blowing from the southward, where the thermometer was many degrees lower."

Thus, too, Mr. Redfield (American Journal of Science, November, 1846, p. 329):

"On the contrary, in times of the greatest depression of the thermometer, in numerous instances, the cold period has been found to have first taken effect in, or near, the tropical latitudes, and the Gulf of Mexico, and has thence been propagated toward the eastern portions of the United States, in a manner corresponding to the observed progression of storms."

This was because the cold north-west wind which followed storms began to follow them as the storms curved and passed to the north-east.

They occur in Europe also. Says Kamtz:

"Such contrasts are not uncommon in Europe, and, in this respect, the Alps form a remarkable limit; for they separate the climates of the north of Europe from the Mediterranean climates, where the distribution of rain is not the same as in the center of Europe. Hence the differences between the climates of the north and south of France. If the winter is mild in the north, the newspapers are filled with the lamentations of the Italians and Provincials at the severity of cold."

These facts seem to indicate a primary action in the counter-trade. Probably in connection with one class of storms they do, and with another they do not.

The difference of seasons in this country, and over the entire northern hemisphere, is often very great. In a remarkable work—published in 1799, 2 vols., by N. Webster, containing a history of the weather for about two centuries. In this work, within that period, are described droughts—"there was not a drop of rain for three or four months, and cattle were fed upon the leaves of the trees."

Winters so intensely cold, that the thermometer fell to 20 degrees below zero, at Brandywine ; or so mild that there was little frost, and people upon Connecticut River plowed their fields, and the *peach trees blossomed in Pennsylvania, in February.* These extremes generally existed in Europe and America at the same time, but occasionally they were opposite and alternate. Says Mr. Webster, in summing up the facts (vol. ii., p. 12): "It is to be observed that in some cases a severe winter extends to both hemispheres, sometimes to one only, and in a few cases to a part of a hemisphere only.

Thus, in 1683, 1779, 1783–4, the severity extended to both hemispheres. In 1640, 1739, and in other instances, the severe winter in Europe preceded by one year a similar winter in America. In a few instances, severe frost takes place in one hemisphere during a series of mild winters in the others ; but this is less common. In general, the severity happens in both hemispheres at once, or in two winters, in immediate succession ; and as far as this evidence has yet appeared, this severity is closely attendant on volcanic discharges, with very few exceptions.

It will be seen that the remarkable work of Mr. Webster attributes great influence to earthquakes and volcanic action. Probably he is correct in this. The present active volcanic action of the western hemisphere is nearly all within the trade-wind region, from Mexico to Peru inclusive. The West India islands are of volcanic origin, and the influence of volcanic action is not confined to a concussion of the earth, or the eruption of lava. Its connection with magnetic action, and disturbance, is unquestionable. But whether they operate to increase or diminish the trades, and the extent to which they induce violent electric action and storms, within and without the tropics, is a question which further observation must determine.

The line of magnetic intensity, which connects our magnetic pole with its opposite, is now upon this continent nearly a north-west and south-east line, and the pole is fast traveling to the west.

It may, and probably will yet, be established, that there is an intimate connection between the cause of volcanic action within the earth, to which the upheaval of the north-west and the south-east, the north-east and south-west ranges were due, and of magnetic action without, and between both, and the cause of *the south-east extension* of our summer storms and belts of showers and barometric *waves*, and the *peculiar north-west wind.*

From this general and somewhat desultory view of the general facts, which bear analogically upon the question, no decisive inference can be drawn in relation to the seat of the primary influence which produces the atmospheric changes. The preponderance is in favor of the magneto-electric action of the earth.

## CHAPTER VII.

We have seen in the preceding chapter where the rainless portions of the earth are, and why they are so. Now let us have a brief notice of the thunder gust and tornado.

The former is exceedingly simple. The showers, which are accompanied with much wind, form suddenly in hot weather, and have a considerable advance condensation (frequently with obvious lateral internal action), extending eastwardly from the line of smooth cloud from which the rain is falling, or rather where the falling rain obscures the inequalities of the cloud. *The gust is never felt until the advancing condensation has passed over us*, when it takes the place of the gentle easterly breeze which previously set toward the shower. The gust ceases as soon as the cloud has passed. It is obviously the result of the inducing and attracting influence of the cloud upon the atmosphere near the surface of the earth as it passes over it. Let the reader watch attentively this advance condensation, from its eastern edge to the line of smooth cloud and falling rain, and he will understand at a glance this internal action of gust clouds. The whole phenomena are simple and intelligible. A cloud approaching from a westerly point, dark and irregular from its eastern edge to the line of falling rain, where it appears smooth and of a light color; wind from the east blowing gently toward it till the condensation is over us; then the gust following the cloud; then the rain, and in a few minutes the cloud, wind and rain have passed on to the east, and "sunshine" returns.

In consideration of the "tornado," as it is termed when it occurs on land "spout,"—if on the water, which is sometimes of a different character—and as it undoubtedly had great influence in inducing the gyrating theory of Mr. Redfield, and the aspiratory theory of Mr. Espy, and has been cited by both in support of the respective theories, it deserves a more particular notice. There are several marked peculiarities attending it which determine its character.

1st. It occurs during a *peculiarly sultry and electric* state of the trade and surface atmosphere, at a line when thunder showers are prevailing in and around the locality, and at every period of the year when such a state of the atmosphere exists. One occurred in Brandon, Knox County, Ohio, in midwinter.

2d. There is always a cloud above, but very near the earth, between which and the earth the tornado forms and rages. It is usually described as a black cloud, ranging about one thousand feet or less above the earth, often with a whitish shaped cone projecting from it, and forming a connection with the earth; at intervals rising and breaking the connection, and again descending and renewing it with devastating energy. Its width at the surface varies from forty to one hundred and eighty rods—the most usual width being from sixty to eighty rods. Sometimes, when still wider, they have more the character of thunder gusts, and are brightly luminous.

3d. Two motions are usually visible, one ascending, one near the earth, and in the middle, and a gyratory one around the other. The latter is rarely felt, or its effects observed, near the earth—objects are thrown obliquely backward by it.

4th. It is composed, at the surface of the earth, of *two lateral currents*, a northerly and southerly one, varying in direction, but normally at right angles in most cases, although not always, with its course of progression, extending from the extreme limits of its track to the axis—which currents are most distinctly defined toward the center and upward. These currents prostrate trees, or elevate and remove every thing in their way. There does not seem to be any current in advance of these lateral ones tending toward the tornado, save in rare and excepted cases, and then owing to the make of the ground or the irregular action of the currents; nor any following, except that made by the curving of the lateral currents toward the center of the spout as it moves on, and perhaps a tendency of the air to follow and supply the place of that which has been carried upward and forward, like that of water following the stern of a vessel. The south current is always the strongest, and often a little in advance of the other, and covers the greatest area. The proportion of the two currents to each other is much the same that the S. E. trades bear to the N. E. This excess in volume and strength of the southerly current will explain the irregularities in most cases, and the fact that objects are so often *taken up and carried from south to the north side*, and so rarely from the north and carried south of the axis. These irregularities are such as attend all violent forces, and something can be found which will favor almost any theory; but the two lateral currents appear always to be the principal actors, except, perhaps, when it widens out and assumes more the character of a straight-forward gust.

5th. This cloud, and its spout, moves generally with the course of the counter-trade in the locality or from some point between S. W. and W. to the eastward, but occasionally a little south of east, deflected by the magnetic wave beneath the belt of showers.

Several exceedingly instructive particulars have been observed and recorded, which are as follows, viz.:

*a. No wind is felt outside of the track*, as those asserts who have stood very very near it.

*b* The track is often distinctly marked, where it passed through a wood, as if the grubbers had been there with their axes to open a path for a railroad. The branches of the trees, projecting within its limits, are found twisted and broken off, or stripped of their leaves, while not a leaf is disturbed at the distance of a foot or two on the opposite side of the tree, and outside of the track.

*c.* As the spout passes over water the latter seems to *boil up* and *raise to meet it*, and *flow up* its trunk in a *continued stream.*

*d* As it passes over the land and over buildings, fences and movable things, they appear to *shoot up* instantaneously as it were into the air and into fragments. If buildings are not destroyed or removed, the doors may be burst open *on the leeward side*, and gable ends *snatched out*, and roofs taken off on the *same side*, while that portion of the building which is to the windward remains undisturbed.

*e.* Articles of clothing and other light articles have been carried out of buildings, through open doors or chimneys, to a great distance, without *any opening* being made for the air to *blow in.*

*f.* If there be a discharge of electricity up the spout from the earth, like that of lightning, the intense action ceases for a time, or entirely.

*g.* Vegetation in the track is often scorched and killed, and so of the leaves on one side of a tree, which is within the track, while those on the other side, and without the track, remain unaffected.

*h* In passing over ponds the spout has taken up all the water and fish, and scattered them in every direction, and to a great distance.

*i.* Persons have been taken up, carried some distance, and if not projected against some object in the way, or some object against them, have usually been *set down gently and uninjured.*

*j.* Buildings which stood upon posts, with a free passage for the air under them, although in the path of the tornado, escaped undisturbed.

*k.* Articles of furniture, etc., have been found torn in pieces by antagonistic forces.

*Note*—Similar occurences take place almost every year—some of a very severe character. I have noticed that the tornadoes of last summer (1857) were more frequent in this country than ever before.

Now to my mind these circumstances indicate clearly that it is not wind or mere currents of air which produces the effect, but that a *continuous current or stream of electricity* from the earth to the clouds exists, and carries with it from near the earth such articles as are movable. That this stream collects from the *northerly* and *southerly* side upon the *magnetic meridian,* in *two currents* with *polarity,* which meet in their passage up at the center; curving toward the center in the posterior part as the spout moves on, when acting in normal manner, and making the "*law of curvature*" observed. That no conceivable movement of the air alone in such limited spaces could produce such effects; or if so, that no agent but electricity could so move the air. That the air in a building could not shoot the roof upward and into fragments—much less could the air in a cellar by any conceivable force be made to elevate *or shoot up* the entire house, and its inmates, and contents—effects so totally unlike what takes place in gales and hurricanes. That elastic free air never did nor could scorch and kill the vegetation, or twist the *limbs* from one side of a tree, while the most delicate leaves on the other, and within two or three feet, remained unaffected. That even if the expansion of the air could produce these effects—if a sudden vacuum were produced—*nothing but currents of electricity could produce the sudden vacuum* by removing the air above.

It is well settled that atmospheric electricity can and does flow in currents with light, by experiments in relation to the brush discharge, etc. That it may do so without light or disruptive discharge, and in a stream, or as it is termed, by convection, with the force and effect seen in the tornado, is perfectly consistent with what we know of it—and it is, I think, clearly evinced that such is the character of the phenomena, by the fact that a sudden powerful disruptive discharge, *with light, up the spout,* produces an instantaneous partial or total suspension of its action; to be renewed as the cloud passes over *another* and more highly charged *portion* of the *earth's surface.* Peltier gives instances where the spout has been entirely and instantaneously destroyed by such a sudden and powerful discharge of electricity; marking the spot where it was so destroyed by a large hole in the earth, from which the discharge issued. And in fact these tornadoes are often steadily luminous, and so much so, when they occur in the night, as to enable persons to read without difficulty.

The lateral inward and upward currents are accompanied, after they meet and unite, or seem to unite, by gyratory or circular ones. How are they produced? This question can only be answered by analogy. No permanent impressions are left by the circular currents, except to a limited extent, and in occasional instances; and observation of them has been and must necessarily be limited and uncertain.

Assuming, however, that the main currents unite and form one from the earth to the cloud, *induced* circular currents would be in perfect keeping with the known laws of electricity. Such currents, and with magnetic properties, are always induced by powerful currents of voltaic electricity passing through wires. And doubtless *in all cases* powerful currents of electricity *induce attendant circular currents.* This may account for the external gyration of the spout.

Or it may be that the two lateral currents of air which attend the currents of electricity, do not unite; having opposite polarity, but pass by and around each other, in connection with the circular magnetic current. Future observation and perhaps experimental research will determine this. But it may not be accomplished by the present generation; for the belief that tornadoes are mere whirlwinds, produced by the action of the sun in heating the land, is adhered to, notwithstanding they cross the intense magnetic area of Ohio in mid-winter, and seems to be ineradicable.

Before concluding this chapter, it may be well to say something about the calorific theory which is at present the prevailing one in Europe and in this country. Meteorologists there and here refer all atmospheric conditions and phenomena to the influence of heat. The principal applications of the theory have been considered.

But within the last few years the elasticity and tension of the aqueous vapor of the atmosphere have received much attention, as exerting an auxiliary or modifying influence. Professor Dove, of Berlin, who ranks perhaps as the most distinguished meteorologist of that continent, attributes barometric variations to *lateral overflows* in the upper regions, resulting from the elevation of the atmosphere by expansion; and in this view meteorologists of Europe seem generally to acquiesce. In an article, recently republished in the American Journal of Science, January, 1855, he thus attempts to account for the annual variation of the barometric pressure, which occurs in Europe and Asia, and, indeed, over the entire hemisphere. He says:

"From the combined action of the variations of aqueous vapor, and of the dry air, we derive immediately the periodical variations of the whole atmospheric pressure. As the dry air, and the aqueous vapor mixed with it, press in common on the barometer, so that the up-borne column of mercury consists of two parts, one borne by the dry air, and the other by the aqueous vapor, we may well understand that as with increasing temperature the air expands, and by reason of its augmented volume, rises higher, and its upper portion overflows laterally," etc.

And in another place he says:

"From the magnitude of the variations in the northern hemisphere, and the extent of the region over which it prevails, we must infer, that at the time of diminished pressure a lateral overflow probably takes place," etc.

Doubtless the mean pressure of the atmosphere in summer, in the northern hemisphere, is less than in winter, in some localities, and greater in others, and it differs in different countries of equal temperature, which is all very intelligible. The mean of the pressure for the month is made up by *averaging* all lhe *elevations* and *depressions*. During a month, showing a very low mean, the barometer may, at times, attain its *highest altitude*, if the depressions below the mean are great or more frequent. The barometer is depressed during storms, and ranges high during *set-fair* weather. Ordinarily, therefore, the more stormy the season the more diminished the mean pressure; and it is a mistake to look to an overflow to account for the fact. The changes in the location of the atmospheric machinery, and consequent change in the amount and severity of falling weather and the periodic frequency and character of storms, and consequent *periodic* depressions and elevations of the barometer, explain the annual mean variations, as they do the other phenomena. But it is perfectly consistent with the calorific theory to attempt to account for these differences by another of those ever necessary modifications, viz., the different countries of equal temperature, and then to *suppose* an expansion of the whole body of the atmosphere and a lateral overflow from the place where the air is expanded, on to some other, where it is not, and thus *suppose* are necessary currents in the upper regions, setting hither and yon, by the force of gravity alone.

Now in regard to this, I am irresistibly tempted to ask, what is the height of this expansion? The moisture of evaporation ascends, ordinarily, but a few thousand feet. The atmosphere grows regularly cooler from the earth to the trade, and *the increased warmth that is felt at the surface extends but little way*. Currents of warm air do not ascend. The strata maintain substantially their positions; and this is a most beneficent provision. In northern latitudes of the temperate zones, all the warmth derived from a few hours' sunshine is needed at the surface; and deplorable indeed would be our condition if the atmosphere, as fast as warmed by the rays of the sun, were to hasten up, and the frigid strata descend in its place. The earth would not be habitable. All the warm air on its surface would be rising as soon as it became warmed, and the cold air above be descending, and enveloping us with the chilling strata which are ever floating within two or three miles above us. No. Infinite wisdom has ordered it other.

wise. The laws of magnetism and of static electric induction and attraction keep the strata in their places, and to preserve us the warmth which the solar rays afford or produce. The inhabitant of a valley, in summer, can plant, sow and reap, at the base of the mountain whose summit penetrates the stratum of continual congelation, and up its sides, almost to the line of perpetual snow; and, as he looks upon the fruits of his labor, and up to the snow-clad peak that towers above him, can thank his Creator for placing a warm equatorial current—a perpetual barrier—between the fertility and warmth which surround him, and the cold destructive strata above; and thank Him for not creating such a state of things, as certain meteorologists insist we shall believe He has created. The like instances have, indeed, fallen under my notice during my recent travel through some of the valleys in Tyrol, near Switzerland, between the Alps and the Alberg mountains; and then, about two years afterwards, I have met with another like instance in a northern portion of Patagonia, South America, in a valley east of the Andes, a new French settlement called Camarona Springs. In short, there is a mass of other evidence in these summaries which shows the truth of what I have written. Now I ask again, where are the upper regions, from which the lateral overflow takes place? The atmosphere is, according to latitude, estimated at from 35 to 45 miles or more in height. Whatever its height may be, it is exceedingly attenuated in its "upper regions." Observe also that two-thirds of the atmospheric density is within five miles of the earth. Air, too, is *compressible*. Allowing for the latter and the attenuation, how many miles, in vertical depth of its "*upper regions*," must move from one portion to another, to depress the barometer two inches, or even half an inch, in twenty-four hours? Let the computation be made, and see how startling the proposition, how utterly impossible that the theory can be true; then there is not a fact or inference in his theory that will bear examination.

## CHAPTER VIII.

Our subject demands a still closer examination of the elements of magnetism and its associated electricities, and their influence upon climate and the atmosphere with a view to the solution of the question in hand.

We know that the earth, and the smallest magnets, exhibit properties in common. The poles of the magnet are some distance from its extreme ends—so are those of the earth. We know that there are two lines, or rather areas, of greater intensity upon the globe. One extending from the American magnetic pole, south-eastwardly, to a corresponding pole in the southern hemisphere; and another, the Asiatic, extending from the Siberian pole to a corresponding southern one, in like manner. We know that from those lines or areas, the intensity, east and west on the same parallel of latitude, decreases each way, to about midway between them.

The magnetic lines which are active from one pole to the other, are currents, or lines of force; for that force produces sensible effects, and we measure it by the movements of the needle. These lines may also be deflected by other magnetic bodies and contracted upon them. The magnetic intensity increases, from the center or equator to the poles, is shown by its attraction. It is now well settled that the lines of equal terrestrial heat are coincident, or nearly so, with the lines of equal magnetic intensity. The points where the magnetic intensity is at a minimum on the magnetic meridian, are the warmest points of that meridian, and those where it is most intense, the coldest; therefore the magnetic elements of a place may be computed from its annual mean temperature, then the laws producing or governing the distribution of one have an intimate physical relation with those producing or governing the other.

The magnetic elements are very intelligible. They are all attributable to attraction, and attraction is greater where intensity is greatest. There is nothing in the earth or atmosphere to make the needle point northerly rather than in any other direction, except magnetic intensity.

Thus the greater intensity of magnetism near the northern and southern points of the globe attracts the corresponding ends of the needle in those directions. And, as magnetism increases in intensity, and the poles are approached, the attraction increases, and the needle dips more and more, till the focus of intensity and attraction is reached, and then it becomes perpendicular. So magnetism is unequally diffused, meridionally, in or over the earth, and there are two equidistant areas where its quantity or intensity is greatest. These exert a lateral attraction upon the needle; it yields to this attraction, and hence its declination. Now these elements, the declination horizontal and vertical forces, and all these periodical, regular and irregular variations of magnetic activity, are intimately connected with the variations of atmospheric condition.

First. They show an increase of activity during certain hours of the day, corresponding to and obviously connected with the diurnal atmospheric changes.

Second. They show an increase of activity during the northern transit of the atmospheric machinery—an *annual* variation.

And third, *irregular variations* of activity corresponding with the *irregular changes* of atmospheric condition.

But, before we examine these results, there is to be observed that the magnetic poles of the earth, or those points towards which the poles of a compass are directed, do not exactly coincide with the poles on which the earth performs its diurnal revolution; this deviation of the magnetic from the true meridian, is therefore termed the variation of the compass. In relation to this, there it seems not only that the earth's poles of revolution do not correspond with its magnetic poles, but also that the latter are not stationary, the line of *no variation*, which has passed through Great Britain in 1657, is now crossing the continent of North America, to account for which it has been conjectured by some, that the magnetic pole revolves round the earth in 644 ears, and consequently in 1979 the line of no variation will again cross the island of Great Britain as it did in 1657; for if the period of the revolution of the magnetic pole be 644 years, half that period is 322; add this to 1657; 1979 will indicate the next return of no variation; that is, there the needle will point exactly with the true meridian to the north and south.

Besides the secular variation we have the magnetic needle moving to the west in summer from about 8 A.M. till about 2 P.M., and the extent of its progress, during its period, constitutes the magnitude of its daily variation. It is found that this variation differs in different months, and that it is normally greatest in the summer months, and least in the winter, in the ratio of about two to one. It is further found, that in different years the maximum activity occurs in different months, and that the years differ also.

There are also irregularities of action disclosed by all, in different months of different years, and of the same year, which are obviously connected with the difference of the seasons; and there are constantly occurring irregularities and disturbances which correspond with the, as constantly occurring, irregular atmospheric phenomena—electricity, etc. Enough appears, so far as we have examined, to confirm the belief that magnetism is actively concerned in the production of the varied changes, as well as the normal conditions of the weather.

In what manner does it act? An answer to this requires an extension of the inquiry. The lines of magnetic force are at every instant passing upward from the earth, *around* and *through* us. Their connection with heat is unquestionable. They are intimately associated, also, with another equally obvious and intensely active agent—electricity. This is every where, in every thing, easily excited into action, and then traceable to a certain, but limited extent. It is set in motion, and becomes obvious to us, by the chemical action of the acids and metals of a galvanic apparatus. We separate it from the atmosphere by friction and excitation, upon non-conductors, as in the electric machine; cleavage of crystals and other exciting operations. We obtain it from magnets, by the magneto electric machine, and from the lines of magnetic force which are ever passing into the atmosphere from the earth, by intersecting them with a movable iron wire, properly insulated.

*From the current of magnetism which has passed through us from the earth, electricity may thus be separated and collected over our heads.* We set it in motion, and obtain it *by heating* different metals in connection, or the same metal unequally; and from certain animals, whose organization is such as to enable them to evolve it. In all these cases, we obtain it in a distinct form; thereby it is made to flow in currents. When thus obtained, and imprisoned in non-conductors, it may be discharged, and with somewhat different effect, as it is discharged in a mass, disruptively, as it is called; as from the clouds in lightning, or permitted to flow convectively, in currents, along the wires of a galvanic apparatus, or in heated air, as from the earth to a cloud in the tornado.

It is, moreover, capable of division into positive and negative, and when concentrated or disturbed in one body, it tends to create a similar disturbance or division in a contiguous mass. To this action of electricity, the term static induction is applied. Thus, a positively electrified body *induces* a division of the electricity in a contiguous body, if both are insulated or surrounded by a non-conducting medium; the negative electricity of the contiguous body being attracted by, and tending to pass to the positive of the adjoining body, and the positive being repelled to the opposite side. That, in its turn, if sufficiently powerful, tends to disturb the electricity; or, if the body which contains it is free to move, to attract that. Thus, by the conflicting action of a positive atmosphere, and a negative earth, and perhaps counter-trade, influenced by magnetism and the solar rays, the currents and winds of the atmosphere are produced, the atmosphere moving with exceeding ease and rapidity. Electricity, excited into currents, or obtained and discharged in either of the methods enumerated, is identical in character, and produces certain well known effects, as follows:

1st. Shocking and convulsing the animal system; producing a peculiar sensation on the tongue, and a flash before the eyes, and in sufficient quantity destroying life.

2d. Producing light—by a spark, as it does in natural phenomena—by the brush discharge, the ball of flame, the flash, or the chain of lightning.

3d. Melting metallic substances by concentration, with a great intensity of heat; as the wire of the galvanic apparatus, and as is sometimes seen in the effects of lightning in fusing metals on persons stricken; and setting combustibles on fire.

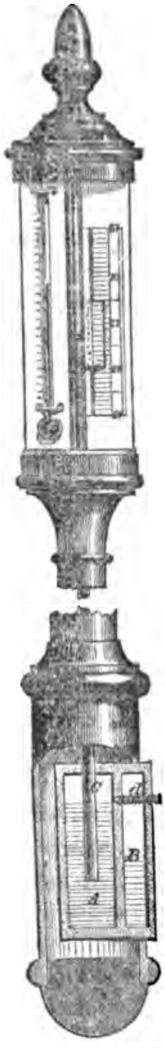
4th. It induces attendant circular or other secondary currents, such as may be seen in the atmosphere during its most violent displays of active energy.

5th. It is also capable of being dissipated by heated air, or carried off by moisture, although isolated by dry air, or ordinary temperature, which is a bad conductor.

Now, although magnetism cannot be collected, confined, or discharged, like electricity, or collected at all, but by its adherence to some substance capable of magnetization, it is obvious there is an intimate association, at least, between it and electricity. *They are never found alone.* All *electricity* will *magnetize.* All *magnetism* will evolve electricity. All *currents* of *electricity* have *encircling currents* of *magnetism*, and all deflect the magnetic needle. All magnetic currents give out to intersecting wires, *currents* of *electricity*, and all magnets *induce* them.

Electricity, therefore, whether identical in substance with magnetism, but differing in form, or whether merely associated with it, as is variously believed, should be present with magnetism, in greater quantity or intensity, where magnetism is most intense and active, and whenever present, should be active and influential. And so we find, from observation, the fact to be. An inconsiderable effort has been made by the advocates of the caloric theories, to ignore the agency of electricity and of magnetism, in the production of the varied meteorological phenomena. But it will not do. The phenomena analyzed, disclose a potential-controlling, magneto-electric agency, and meteorology will advance rapidly to perfection, as a simple, intelligible, and practical science, *as soon as that agency is admitted*.

Electricity is always perceptibly present in storms and showers within the tropics. Most of the rain from the tropical belt, falls from "thunder-showers." So hurricanes and typhoons, and all tropical storms, are confessedly, and in proportion to their intensity, "*highly electric*." This excess of quantity or activity of electricity, exists in connection with the movable atmospheric machinery. When it moves up north in summer, and arrives at its highest point of northern transit, *storms* are very *uncommon*, and the tropical form of clouds and showers, with thunder and lightning, prevail. This is most obvious, if not most influential, where the magnetic intensity is greatest. Violent showers and tornadoes are more frequent in this country than in Europe; and over the area of the greatest intensity, as in Ohio, than at a distance, on the extreme eastern and western coast. And the same is true over the intense magnetic area of Asia.



Electricity too, like magnetism, has its diurnal and its annual variations, and also its irregular ones, and they are most obviously and intimately connected.

Having thus taken a general view of the nature of magnetism and its associated electricities, and their connection with the general and obvious peculiarities of climates, let us approach more nearly the varied atmospheric phenomena as shown by the oscillations of the barometer resulting from variations of atmospheric pressure, temperature* and condensation, and give them a closer consideration. But, before proceeding to do this, it may be well to give a short description of the barometer and an explanation of its use, viz:

The Barometer generally consists of a glass tube (G) 34 inches long, closed at the upper end, and the lower end being let in to a cistern (A); both together are filled with mercury, and then attached along in the middle of a wooden case. There, in the upper part of the case, is a plate on which are graduated the sequent number of inches, counting from the base; these are again divided into tenths and hundredths of an inch. So when the instrument be put in a perpendicular position, the atmospheric pressure acting then upon the surface of the mercury in the cistern to such a degree as to counterbalance a column of mercury to the same height as it would correspond with the actual state of the atmosphere proper to its location.

In order to enable a person to express his observations accurately upon the various changes taking place in the atmosphere, as they are indicated by the column of mercury, there is, by means of a hand applied to the plate, to be slipped up or down at pleasure. So too, in the explanation of its use, I shall endeavor to relate a few facts which will serve to show that the barometer is a very useful instrument. In the first place, it indicates the future state of the weather; for that reason alone, no family should be without one, particularly the farmer, for he would be enabled to follow his business in the field with greater success. The barometer is also extremely useful in measuring heights. The cause which produces the result in this connection, is the effect, from the elasticity of the atmosphere, which diminishes as the aerial space enlarges. Thus, the suspension of the mercury in the tube is due to the atmospheric pressure; when it is carried to a place above the sea, its column becomes shorter. This is proven by the result of actual experiment, which led me to the arrangement of a very easy rule by which even the traveler on the cars can now, by means of the barometer, determine with great facility, and a considerable degree of accuracy, the height of any place whatever, above the sea.

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* The degrees of temperature used in this work are those of Fahrenheit.

Again the oscillations of the barometer have taught us that the mean pressure of the atmosphere at the level of the sea is equal to about 14½ pounds on the square inch. This same pressure is also equal in weight to a column of mercury one inch square and thirty inches high. And again, by these means, we are enabled to ascertain the pressure of the whole mass of the atmospheric air with almost as much precision as if we actually weighed it.

By means of long-continued observations of the barometric changes which are due to the atmospheric conditions, I have been enabled to deduce the following general results, which will be found new and of great practical interest, for such will not only serve to remove frequent misconceptions in consulting the instrument, but the observer can with greater convenience form his opinion of the future state of the weather, and also determine the height of his locality from the level of the ocean.

Before consulting a barometer, it should be remembered that the range of its mercurial column is greater in winter than in summer, and that, by the average pressure of the atmosphere at the surface of the ocean, there the mean height of the mercury, at a mean temperature of 32 degrees, stands at 30 inches. But when on the continent, where its mean be found one-tenth below 30 inches, indicates an elevation 86 85 feet above the sea.

From these facts it will be seen that the changes of weather are not indicated by the actual height of its mercury to the words "fair, change, etc." generally marked on the plate.

The indications can only be determined by its variation of height and the manner in which that variation takes place. Therefore the observer of a barometer is desired to devote his attention to the following notes:

1. Set the barometer in the morning, and when the mercury rises one-tenth above its normal position, indicates *Fair.*
2. A depression of .05 inch from that point indicates *Change.*
3. A depression of .08 indicates (in about twenty-four hours) *Rain.*
4. A sudden and considerable depression indicates *Stormy.*

5. A very sudden and considerable depression, at the rate of one-tenth inch an hour, indicates *Hurricane.*

6. An indication of rain, the rain not falling, indicates *Dry Weather.*

7. If no indication of rain, and rain should fall, indicates *Wet Weather.*

8. A sudden and rapid rise of the mercury is an indication of a fresh and strong N. W. wind; and a clear sky will follow.

The annual mean of the barometer (with the thermometer attached) can be ascertained by registering their daily heights at noon; and then, after one year's observation, add up those daily heights, and divide the product by the number of observations. The quotient will express the annual mean.

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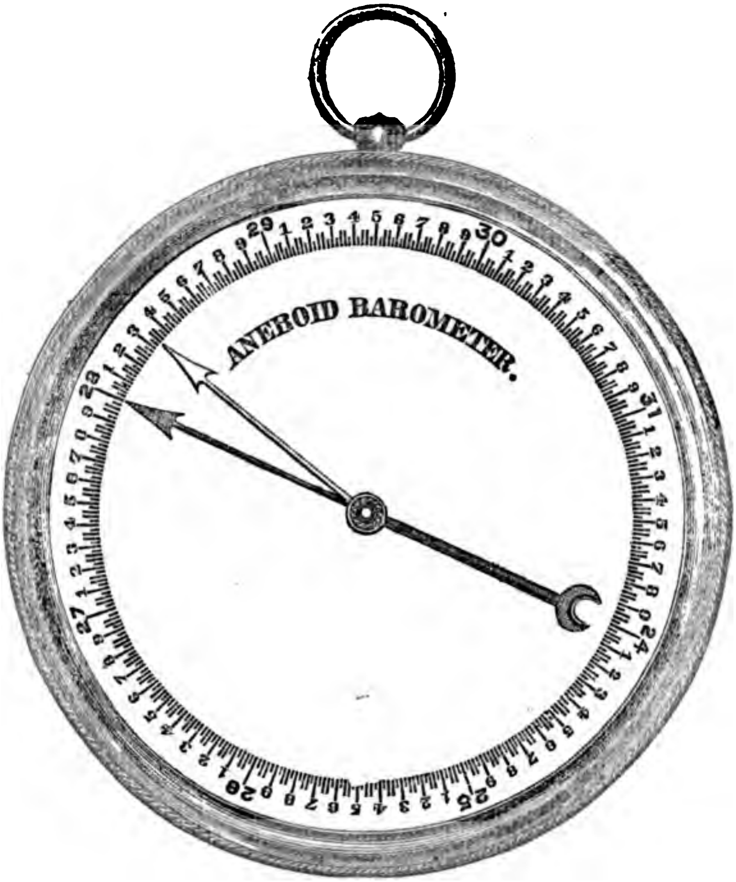
## THE ANEROID BAROMETER.

Experience has shown that the column falls before the approach of a storm, and rises before fair weather. Hence this instrument is of great value to the sailor upon the ocean; and few or no ships sail without being provided with one. It is also of *exceeding value to the farmer, especially in haying and harvesting time.* Some have objected to the mercurial barometer for farmers' use. One of these objections is its cost, growing out of the great care necessary in its manufacture, to render it perfect, in depriving the column of every particle of air, which is done by boiling the mercury in the tube, and by other means involving considerable labor and expense. These instruments are sold as low as seven to ten dollars, but reliable standard instruments sell for a much higher price. Other objections are its *liability to break and to get out of order.*

Recently another form of the instrument has been invented, which in many respects is much preferable, and is known as the "aneroid barometer." The name is significant of the formation of a vacuum without a fluid; and the form of this barometer is greatly in contrast with the Torricellian tube. The principle on which this instrument operates seems to have been first noticed by M. Conte, a French professor, but was finally reduced by M. Vidi. At the New Haven agricultural lectures, in February last, Prof. Silliman, Jr., devoted an hour or two to the subject of meteorology, in which he described the various forms of this instrument. Of the aneroid barometer, which he deemed the most important instrument that could be placed in the hands of the farmer, he said: "Unqualifiedly, it is the *best for the farmers' use;* and for the scientific man, its portability, and almost total unliability to accident, strongly recommend it. The old mercurial barometer, with its marks of 'cloudy,' 'rain,' 'fair weather,' etc., *is utterly unreliable;* for the pressure of the atmosphere at divers heights is different; and the pressure that near New York rises to 'fair weather,' would at a higher place, say the prairies, stand at 'foul' And then, again, if roughly handled, air will leak into the instrument, and its value be utterly destroyed. The aneroid barometer (or the 'without fluid' barometer) was first invented by M. Conte, a professor at the Ærostatical School at Meudon, near Paris; *but an American mechanic* has made it much cheaper, and as *equally reliable as the expensive French Instrument.*" He sells it for the moderate price of $7 50—only one-third the cost of a Smithsonian barometer.



The aneroid consists of a flat and circular metallic box, the cover of which is very thin and corrugated, or in ridges and furrows, concentric with the walls. The air is exhausted from this box, which is then hermetically sealed. The result is that the elastic cover rises and falls with every change in atmospheric pressure. By means of a combination of levers and springs, these movements are communicated from the center of the cover, to a pointer which moves over the graduated face of the dial, on which inches and hundreths are inscribed, which correspond with the height of the column in the mercurial instrument. The whole apparatus is encased in a brass box, about four inches in diameter, and two inches deep, covered with a front glass, and resembling, in general appearance, a chronometer case.

Having tested the barometer to my own entire satisfaction, and knowing others who have also done so, and being repeatedly assured that they have *often saved* *their cost in a single haying season,* I give it a hearty commendation, and take this method to introduce it more generally to the notice of farmers. None should, however, expect that as a weather prophet the barometer will be found of unerring accuracy and exactness, for no infallible means of predicting approaching changes have yet been discovered. The state of the weather depends upon various conditions, of which the weight or density of the atmosphere is but one—the amount of moisture contained in it is another; temperature is a third; electrical changes a fourth, and so on. Then again local causes have much to do with the weather in any given locality. But in connection with the ordinary appearances in nature, which all persons more or less observe, and which from time immemorial have been recognized as indicating changes, the barometer renders exceedingly valuable assistance in judging; and the more so that its testimony touches a point which we have no other means of ascertaining, i. e. the density of the atmosphere at the time.

As before remarked, the average height of the barometer at the sea level is about thirty inches. As we ascend from this level the mercury falls, for the simple reason that we leave a portion of the atmosphere beneath us, and of course there is less weight above. Every hundred feet we rise the column falls about a tenth of an inch, so that it is no particular height which indicates either fair or foul weather—*but we judge only by the changes.*

Prof. Sillman gives the following rules which embody the results of long and various experience in different places:

1. When the mercury is very low high winds and storms are likely to prevail.

2. Generally, the rising of the mercury indicates the approach of fair weather; and its falling shows the approach of foul weather.

3. In sultry weather the falling of the mercury indicates thunder. In winter its rise indicates frost. In frosty weather its fall indicates thaw, and its rise indicates snow.

4. Whatever change of the weather suddenly follows a change in the barometer may be expected to last but a short time.

5. When the barometer alters slowly a long succession of foul weather may be expected, if the column falls, or of fair weather if it rises.

6. A fluctuating and unsettled state of the barometer indicates changeable weather.

In the above rules the *index hand of the aneroid* answers to the *mercury column* of the old barometer. Mr. Kendall furnishes the following rules:

1. There is no point at which the barometer must stand to indicate rain or wind.

2. The judgment must be governed by the rising or falling of the barometer.

3. The falling of the barometer indicates the approach of a storm, the extent of which will be proportionate to the amount and rapidity of the fall.

4. Showers. The barometer falls previously from four to twelve-hundreths of an inch, varying in time from one to three hours. The greater and more rapid the fall, the more violent will be the shower—accompanied more or less with wind.

5. North-easterly storms. The barometer falls previously from four to eight-tenths of an inch, varying in time from one to four hours; and continues falling until the storm arrives at its crisis, when the barometer begins to rise, and continues rising until that part of the storm which comes from the north-west passes off.

6. Southerly storms. The barometer falls previously from one to four-tenths of an inch, varying in time from six to twelve hours. These storms generally precede unsettled weather; at such times the barometer continues low, and very slight additional depression are followed by rain.

A southerly storm is perhaps the most difficult to judge of by appearances, as they change so frequently without any real change in the atmosphere. During this class of storms the utmost confidence should be placed in the barometer.—After the first indication as above, and the barometer does not rise but remains stationary, it is strong indication that the storm has not all passed.

The foregoing rules are the result of long and careful observation. It must be remembered that storms occur under different circumstances in different parts of the globe; yet, taking the first three of the above rules as a basis of calculation, a short experience, with the exercise of the judgment, will enable one to determine very correctly concerning approaching changes in the weather.—*Agriculture of Maine, by S. L. Goodale.*

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In order to show how to find the mean height of the barometer, there it is necessary to observe its various oscillations from September to September, and from that to the first January, this being a period of sixteen months observations, during which we will be enabled to obtain five annual means. Thus the monthly means, from September to September, will at this rate express the first annual mean. Those from October to October, the second; from November to November, the third; from December to December, the fourth; from January to January, the fifth. Also, when these five annual means are added together, and their product divided by five, the quotient will be the result of the mean height of the mercurial column proper to the height of its locality from the ocean.

To determine the height of localities above the level of the sea, we have the following:

Supposing the mean height of the barometer at a certain place had been found to be 29.54 inches, and the mean temperature 52 degrees.

As the barometric mean be always subject to a correction for temperature which is due to the expansion of the mercury in the cistern, we therefore reduce the mean temperature to the freezing point, as follows:

OPERATION.

1. Subtract 32 degrees from the mean temperature 52
and divide its difference by 5. 32

Divide 20 by 5, quot. 4.

| | |
|---|---|
| 2. Subtract this quotient from the barometric mean; the remainder will be the correct mean. | 29.54<br>4<br>29.50 |
| 3. Subtract the corrected mean from 30 inches, and then, | 30.00<br>29.50<br>.50 diff. |
| 4. Multiply 86.85 by the above difference; the product will be the number of feet in height above the level of the sea, as is shown by the operation in the margin. | 86.85<br>50<br>Ans. 434.25 ft. |

Now let us examine the peculiar effects of the atmospheric pressure, to which the barometric changes are obviously due. We have a meteorological day which commences at 4 A. M. At that hour the barometer is at its morning minimum. It has a perceptible diurnal variation of two maxima and two minima. Its periods of depression are at 4 A. M, and 4 P. M., and of elevation at 10 A. M., and 10 P M. The difference between the elevation and depression is, within the tropics, .08, and in our latitude, about .03 of an inch, and is decreasing toward the poles. At 4 A. M. it is then at one of its minima, and rises till 10 o'clock. At or about the same period, and sometimes when the barometer is falling, and previous thereto, there is a tendency to fog in localities subject to that condensation. This tendency is sometimes observed at the other barometric minimum, late in the afternoon or early in the evening, but less frequently. The tendency to fog condensation is greatest in this country about the morning minima. It seems to be owing to the influence of the earth; it is confined to the surface atmosphere, and is apparently produced by the inductive agency of the negative electricity of the earth. It disappears, whether it be high or low fog, about the time when the barometer attains its morning maximum, or about 10 A M. At about that period, when there has been a fog, or earlier, when there has not, and sometimes as early as 8 A. M., there is a tendency to trade condensation—cirrus in mid-winter, and a cumulus in mid-summer, during the intermediate time—a tendency to cirro-stratus, partaking more or less of the character of one or the other, according to the season.

Temperature, at all seasons, commences its diurnal elevation about sunrise, being the coldest period of the day, and then rises till about 2 P. M. From that time it falls again till next morning at sunrise. It has but one maximum and one minimum in the twenty-four hours.

As soon as the morning barometric maximum approaches, and the heat increases the magnetic activity, condensation in the upper portion of the surface atmosphere appears, and even that portion, near the earth, is affected and attracted; and the "wind rises" according to the locality, the season, and the activity of the condensation. The tendency to blow increases with the tendency to cumulus condensation, and continues till toward night, when it gradually dies away, unless there be a storm approaching. As the heat increases, and stimulates magnetism into activity, the magnetic needle commences moving to the west, its regular diurnal variation, and continues to do so until about 2 P. M., when it commences returning to the east, and so continues to return until 10 A. M., when it moves west again until 2 A. M., and from thence to the east till 8 A. M.

From this it will be seen that the temperature has but one maximum and minimum, and that is exceedingly regular, and does not correspond with any other.

The barometer has two; electric tension, two; magnetic activity has two; and condensation, two—one the formation of cloud, and the other the formation of fog and dew.

Fog forms at one barometric minimum and cloud at another.

Fog forms at one period of the magnetic variation, cloud at another.

The formation of clouds corresponds with the greatest intensity of magnetic action, and its associated electricities.

The barometer falls when horizontal magnetic force, and a tendency to cloud and wind increase; and rises when they decrease. This corresponds with the character of the irregular barometric oscillation. Barometric depressions accompany clouds and wind; and are in proportion to them, and are all greatest where magnetic force is greatest. The barometer also rises as the magnetic energy decreases.

Now, the reader who has attentively perused and considered the facts stated, and the principles deduced, in the preceding pages, and is ready to make a practical application of them by careful observation, particularly when, with the assistance of the barometer, he will have very little difficulty in understanding the varied atmospheric conditions; and will also soon be able to form a correct judgment of the immediate future of the weather, so far as his limited horizon will permit.

But still I have some other facts to relate, namely, some of the proverbs and signs that have been accumulated by popular observations of our ancestors, which will materially aid the reader in his observations, as follows:

"A rainbow in the morning,
The sailors take warning;
A rainbow at night
Is the sailor's delight."

Rainbows are not reflected from clouds, but falling rain; and a morning rainbow at the west is, of course, evidence that it is *actually raining there*, and will in all probability pass over us. "Thunder in the morning, rain before night," is a common saying, and a true one, viz: there is a belt of showers, or showery period approaching, of unusual intensity; for thunder showers in the morning are rare. The afternoon is their most common period, and they are very apt to appear then, when the morning is showery.

Here we have another allusion to the weather, of great value and truth, viz:

"An evening red and a morning gray
Are sure signs of a fair day;
Be the evening gray and the morning red,
Put on your hat or you'll wet your head."

The sky is red, if there be no condensation at the west to obscure the rays of the sun; if there be, it is gray, or there is a bank of cloud and it is obscured. So if there be no condensation over, or to the east of us, in the morning, to reflect the rays of the sun, the sky is gray; if there be such condensation, the sun is reflected from it, and the sky is red. Such morning condensation is indicative of foul weather. Let not the sun go down without attention. Banks of clouds in the north-west indicate rain at all seasons.

The number of the stars visible, and the *distinctness* with which they may be seen, indicate the absence or presence of condensation; viz., the brightness of the stars as well as the clear appearance of the moon, show the absence of condensation and the *dissolution* of the fleecy clouds at the close of the day is always a fair weather indication.

Thus, from the couplets of an old almanac:

"If woolley fleeces strew the heavenly way,
Be sure no rain disturb the summer day."

When we see a circle round the moon, there it shows the condensation is present, and is also an indication of rain.

Thus:

"Last night the sun went pale to bed;
The moon in halos hid her head;
Then fiery red the sun doth rise,
Then wades through clouds to mount the skies."

And another:

"The smoke through chimneys ascends,
Then, spreading, back to earth it bends."

Smoke is electrified *positively*, by the act of combustion; the earth and the adjacent atmosphere, when storms are gathering or approaching, is negative. Hence the smoke spreads, and is attracted downward by an opposite electricity. On the other hand, it is interesting to see, at other times, when the whole atmosphere is positive, with what rapidity and compactness the smoke will ascend in a *straight and elevated column* from the chimney, repelled by a similar electricity. I know it is generally supposed the smoke descends because the *air is lighter*. But it is a mistake; then sometimes it descends when the barometer stands very high above its mean. We have still another sign of condensation which is sometimes visible. When the sun shines clearly at the east or west, through a *small opening* in the clouds, the condensing vapor is shown by the strength of sun-light, just as the fine particles of dust are seen in a dark room, when a few rays of sun-light are admitted through a small aperture. This phenomenon is often observed, and it is said of it—It is going to rain; *the sun is drawing water.*

"Here we have the whispering grove,
That betrays the gathering elemental strife."

The whispering means the motion of the leaves; these are often stirred by a peculiar motion which is not that of wind. Sometimes every leaf upon a tree may be seen vibrating with an *upward* and *downward* motion, when there is not wind enough to stir a twig. This interesting phenomenon is electrical. Trees and all vegetables, confessedly, discharge electricity, and such discharges move the leaves when very active.

Dr. Jenner says:

"The leech, disturbed, is newly risen
Quite to the summit of his prison."

This is something that is strikingly true; but few will have opportunities to observe this: in fact, it is difficult to conceive how mere condensation, from an increase of vapor in the atmosphere, should be foreseen by the leech in his watery confinement. From these facts, it is obvious that there is an electric change which reaches him, as it does the whole animal creation; viz., the rheumatism, the corns, and the once broken bone, &c.

Even the conduct of different animals furnish a considerable portion of the like signs, which are indeed very important auxiliary evidences of the approaching changes, whether from dry to wet, or wet to dry.

The observer will find in the conduct of our birds, especially the rooster, who keeps ceaseless watch over his hens, that he is the most reliable weather-watcher we have—more so when he gets a little older and more experienced; and then it is very interesting to observe how closely he watches the weather, and how he will foretell the coming storm of to-morrow, by sounding forth *in the evening*, and so often, his defiant note. Such note in the evening is invariable evidence of foul weather. So, too, during the night, his earlier and more frequent crowing is often indicative of it. Often, when a storm is gathering in the forenoon, he will announce it by an almost incessant crowing. In short, the habits of an *experienced* old-fashioned rooster of this kind will repay attention; but I cannot answer for the Shanghai.

Still another assistance may be derived from occasional accounts of the state of the weather elsewhere, which the telegraphic reports afford. On this point we are in hope that, in the future, the time must come when the collection and dissemination of meteorological truth will be deemed an object of national importance, and national duty. Our country is, physically, a most favored one. The facts disclosed in the preceding pages show that it is without a parallel on the face of the globe; and our facilities for meteorological observation, and the ascertainment and practical application of meteorological truth, are equally pre-eminent. Then the existence and prospective increase of telegraph lines over most of its surface; the homogeneous and energetic character of a population united, upon so large surface, under one government; the freedom of that government from debt, and the excess of its revenue, give us an opportunity and a capacity for connected observation and investigation, and an ability to profit by it, that no other nation can boast.

Our exploring ships have penetrated and made discoveries in both hemispheres, and our travelers have visited successfully every clime; and thus our national interests, obligations and pride, demand an organization, practical and permanent, in relation to this subject, and the time will come when we shall have it. When that time comes—when the present *limited horizon* of each is *practically extended over the entire country*—and when the actual state of the weather over every part of it is known, at the same time, to the inhabitants of every other, and every where *read in the light of a correct philosophy*, prognostication will be comparatively simple and certain, and a *Progress* will have been made productive of an amount of pecuniary, intellectual, and social benefit to the people which cannot be overestimated.

*A Table of Meteorological Observations at Columbus, O., by J. B. Richard.*

| MONTHS. | BAROMETER. | | | | THER | | |
|---|---|---|---|---|---|---|---|
| | Max. | Min. | Range. | Mean. | Mean. | Rain. | Snow. |
| 1856. | Inches. | Inches. | Inches. | Inches. | Degrees. | Inches. | Inch's. |
| September | 29 44 | 28.89 | .55 | 20.23 | 67.2 | .70 | .. |
| October | 29.54 | 28 87 | .67 | 29.269 | 56.9 | .85 | .. |
| November | 29.52 | 28 59 | .93 | 29.202 | 43.2 | 2.85 | .. |
| December | 29.69 | 28.34 | 1.35 | 29 20 | 30.4 | 2.78 | 1¾ |
| 1857. | | | | | | | |
| January | 29.69 | 28 81 | .88 | 29.263 | 21.0 | 1 36 | 10⅞ |
| February | 29 82 | 28.78 | 1.04 | 29.268 | 43.2 | 2 60 | ½ |
| March | 29 52 | 28.74 | .78 | 29.182 | 39.3 | 1.36 | 4 |
| April | 29.45 | 28.75 | .70 | 29.083 | 43.9 | 2.51 | 3¼ |
| May | 20.34 | 28.57 | .77 | 29.095 | 59.7 | 5 50 | .. |
| June | 29.33 | 28.74 | .59 | 20.09 | 70.4 | 4.75 | .. |
| July | 29.39 | 28.94 | .45 | 29.20 | 74.2 | 3.24 | .. |
| August | 29.46 | 28.94 | .52 | 29.227 | 73.7 | 3.58 | .. |
| Ann. Mean | 29.69 | 28.34 | 1.35 | 29.192 | 51.9 | 32.08 | 20⅜ |

Corrected mean, 29.152.

REMARKS.—The greatest height of the barometer was 29.69 inches, December the 18th, and January the 8th; the least, 28.34 inches, December 14th. Extreme range for the year, 1.35 inch.

The maximum temperature was 93 degrees, on the 13th July; minimum, 12 deg. below zero, on the 23d January. Range for the year, 105 degrees.

The total quantity of rain, including melted snow, for the year was 32.08 inches, being nearly *eight inches below* the average quantity, which, for a period of ten years, is 39 94 inches.

*A Table of Meteorological Observations at Columbus, Ohio. Lat.* 39° 57′ *N. Long.* 83° 3′ *W. Barometer* 740 *feet above the Atlantic. By J B. Richard.*

| MONTHS. | BAROMETER. | | | | THER. | | |
|---|---|---|---|---|---|---|---|
| | Max. | Min. | Range | Mean. | Mean. | Rain. | Snow. |
| 1857. | Inches. | Inches. | Inches. | Inches. | Degrees. | Inches. | Inch. |
| January | 29.69 | 28.81 | .88 | 29.263 | 21.0 | 1.36 | 10⅞ |
| February | 29 82 | 28.78 | 1 04 | 29.268 | 43.2 | 2.60 | ½ |
| March | 29.52 | 28.74 | .78 | 29.182 | 39.3 | 1.36 | 4 |
| April | 29.45 | 28.75 | .70 | 29.083 | 43.9 | 2.51 | 3¾ |
| May | 29.34 | 28.57 | .77 | 29.095 | 59.7 | 5.50 | |
| June | 29.33 | 28.74 | .59 | 29.09 | 70.4 | 4 75 | |
| July | 29.39 | 28.94 | .45 | 29.20 | 74.2 | 3.24 | |
| August | 29.46 | 28.94 | .52 | 29 227 | 73.7 | 3 58 | |
| September | 29.50 | 29.05 | .45 | 29.31 | 69.7 | 2.12 | |
| October | 29.48 | 28.78 | .70 | 29.216 | 54 5 | 4 84 | |
| November | 29.70 | 28.15 | 1.55 | 29.123 | 41.4 | 6 35 | 3¼ |
| December | 29.65 | 28.66 | .99 | 29.174 | 41.0 | 3.54 | ⅞ |
| Ann. Mean | 29.82 | 28.15 | 1.67 | 29.186 | 52 7 | 41.75 | 23½ |

Barometer mean reduced to 32°, 29.142

REMARKS.—The greatest height of the barometer was 29.82 inches February 10th. The least 28.15 inches November 19th.

Extreme range, for the year, 1.67 inches.

The total quantity of rain, including 23½ inches melted snow, was 41.75 inches —being 1.81 inches above the average quantity.

# HOW VINEYARDS ARE MANAGED IN FRANCE.

The vineyards of France cover an area of about 5 millions of acres, mostly hill-sides and stony soils; their annual production is an average of 60 millions of hectolitres, or 1600 millions of gallons, which at the average price of 50 francs or $10 the hectolitre (37½ cts. per gallon), amount in round numbers to $600,000,000.

Agricultural industry has greatly enhanced the value of this raw material, by turning the coarsest part of it into alcohol, brandy and ether; the former article being used, instead of water, by several lines of sea and river steamboats. Finer wines, being properly clarified and attended to, acquire a double, some of them a tenfold value, in the space of two or three years.

These vineyards supply, also, the elements of various branches of agricultural industry, most of them having fruit trees planted between the rows of vines. Thus large quantities of plums, peaches and cherries are gathered therefrom, to be either dried or preserved in jars, with liquor and syrup; the superabundant fig trees of the south supply the commerce with a well known article of exportation; whilst the olive tree seems to be the natural companion of the vine, the pomegranate, apricot, pear, apple, almond, chestnut, quince and walnut prosper among the vines, which protect their roots against heat.

Having no positive records as to the value of the extra crop of fruit and oil—leaving aside the increased value of wine derived from age, management and distillation—we will consider the vintage of 1861, as presented by acknowledged French authorities.

Owing to late frosts and rains in the spring of the year 1861, and also to protracted, excessive drought in the subsequent summer and fall, the product of the vintage fell short by one-fourth of an average yield, viz: to 45,000,000 of hectolitres. Supposing this short crop placed into whisky barrels, piled five upon one another, and drawn into a line, they would extend from Washington to London.

The average price of the hectolitre being $9.50, this crop amounts to $427,000,000. Deducting therefrom one-half for taxes and cost of production, we find a net profit of say $200,000,000, that is $40 to the acre, besides fruit and other values already noticed.

In the meanwhile the wheat crop of France was disastrous, owing to the aforesaid atmospherical phenomena; $100,000,000 worth of foreign wheat was wanted and obtained; to avert famine the French farmer had to give up half of his profit on wine, but he still retains $20 profit on the acre with a short crop. Such is the importance of the wine interest. The moral effects of wine growing are still greater; drunkenness checked; health sustained or restored; cheerfulness and happiness promoted, age protracted, social intercourse encouraged.

A distinguished wine grower of France, Dr. T. Guyot, lately introduced a new mode of trimming and managing the vine, which bids fair to create a revolution in that line. His method is being eagerly adopted, because experience shows its merits, which are almost wonderful, as evinced by numerous records. For instance, in 1861 a Mr. Laurens, President of the Agricultural Society of Ariège, made an experiment in his own old vineyard of about half an acre; he trimmed one row of vines according to the old method, and the alternate line was treated according to the new. All circumstances being equal, the result was as follows:

| | Old method. | New method. |
|---|---|---|
| Number of vines | 1,909 | 1,894 |
| Number of grapes | 2,362 | 4,655 |
| Weight of grapes | 333 kil's | 896 |
| Measures of wine | 8.40 | 22.67 |

Thus, the mere operation of trimming may increase the value of the French vineyards and their annual production to the amount of over $800,000,000; the mode of "planting," as recommended by Dr. Guyot, appears to have a still greater effect, inasmuch as it improves the quality of the wine, besides the quantity.

The system of "cultivation" is a novelty in itself, and a step towards that future state of perfection which will free agriculture from atmospherical injuries. Following Dr. Guyot's instructions, many a vineyard is protected from frost, wind, sun or rain, according as the case requires, by straw mats, which are spread over or by the side of the vines; these mats are supported by a permanent system of iron wires and sticks; they are rolled up in winter and piled at convenient distances, so as not to interfere with plowing or spreading the manures. Machinery being applied to the manufacture of straw mats, they are produced in immense quantities, and sold at the reduced price of 2 cents the yard.

Dr. T. Guyot lately published a book on wine and vineyards, which ought to be in the hands of every person in this country who has a vine, or who intends to plant any. Perhaps it will be discovered that our wine growers are not in the right path; that the German system of planting, cultivating and manufacturing wine may be very good with the cold climate and poor ground of Germany, but our rich soil, hot summers and late falls are perhaps fitted to grow generous, highly-flavored wine, instead of the sourish lymphatic nectar that we drink.

The treaty of free trade between England and France, which is being extended to other nations, opens new markets to the cheap wine of France; the demand is already considerable from those countries where heavy tariffs heretofore predominated, so that new plantations are being made to supply anticipated demands.

Cooperage is, of course, an important industry in wine growing districts; there, American staves find a ready market and obtain remunerative prices; thus, for instance, pipe staves 7 feet long 6 inches wide command 10 cents apiece; these are destined for brandy pipes and casks, which in part return to us with attractive form and fiery contents; they are also exclusively used to store up the finer wines which grow in the district of Bordeaux. This trade has been heretofore in the hands of Southern merchants at New Orleans, Charleston and Norfolk.

The celebrated, highly-flavored Burgundy wine, which is almost monopolized by the rich merchants of Holland and Belgium, being unable to withstand uninjured the rough shakes of land or sea conveyances, reaches the Flemish cellars through quiet canals, and is there allowed to mature its flames by long and quiet sojourns of ten to twenty years.

The Burgundy barrels are made from the good timber of the Ardenne forest, mostly oak; but the greatest part of the French common wine is put into chestnut barrels.

The chestnut tree is extensively planted in the central and southern mountains of France; it grows as well in orchards as in thickets, and produces, besides timber, staves and hoop-poles, an excellent large fruit, which is the principal nutriment of numerous, strong, healthy, long-lived populations. The chestnut is also constantly found in all the markets of France, either dry, during the year, or fresh in the season, that is, during the fall and winter, when, on account of its reduced price (50 to 60 cents a bushel), it is to be found upon the table of the poor as a nutriment, and of the rich as a luxury; in both cases it is boiled with salt, or roasted over bright coals by means of a roaster.

Our native chestnut trees should be subjected to cultivation and grafting; then we would have a fruit worth eating, because it would acquire three or four times its present size.

The cultivation of the chestnut tree on a large scale would be very profitable, on account of its rapid growth and the variety of its products; besides hoop-poles, staves and timber, it affords a good nutritious fruit, which is adapted to the manufacture of starch, molasses, alcohol and sugar.

Dr. Guerrazi, of Florence, obtained from the Italian chestnut 60 per cent. of good flour, which was made into bread; from a second lot of the same fruit he made 40 per cent of molasses, and therefrom some crystallized brown sugar, in the proportion of 10 per cent. of the chestnut. These experiments were frequently repeated in various parts of Europe.

In order to estimate the value of such products in regard to our State, we take the statistics of the poorest district of France. The county (or department) of Haute Vienne contains 100,000 acres of chestnut groves, yielding 24 bushels of fruit to the acre; the bushel weighs about 60 lbs.; that is 1440 lbs. to the acre, and 144,000,000 lbs. for the county.

Reducing this into flour, we find at 60 per cent. 96,500,000 lbs., equal to 482,500 barrels. The same, made into molasses, would give 57,500,000 lbs, or 7,000,000 gallons; and if we reduce it into sugar, we find 14,400,000 lbs. Finally, the acre yields 860 lbs. of flour, or 680 lbs. of molasses, or 144 lbs. of sugar.

Considering that 860 lbs. of flour represent about 22 bushels of grain to the acre, that it can be obtained for periods of fifty years, without plowing or sowing, it is worthy the attention of our farmers. Imported, large chestnuts are found by the bushel every winter in New York, and can be used for seed.

When the vintage is abundant, casks, barrels and pipes are much sought after, prices rise in consequence of the demand; poor peasants are obliged to resort to oil or grease barrels, which require much cleaning and scouring, and still command a price of $2 to $3. These even are not always available; in such an emergency, the standing crop not being allowed by municipal authorities to remain ungathered, many an unfortunate farmer who could not sell his wine has been reduced to the dire necessity of pouring it away in order to make room for his new vintage.

No less desperate is the position of some others, who having bargained for large lots of wine to be delivered at the distillery, by an unlucky fall in the price of brandy, find themselves deprived of the total value of their wine, and scarcely recover the expenses of transportation. Indeed brandy, pure genuine brandy, is sold as low as thirty-two cents a gallon, in some districts, when the vintage is plentiful. This was generally the case before the appearance of the "oidium." Although this parasitical fungus is very hurtful to the wine, it was hailed by many selfish individuals as a blessing, because the price of brandy reached a high figure, viz: $1.50 per gallon. It remains now (1861) at the reasonable price of 75 cts. per gallon, but it will probably rise again in 1862 on account of the last partial failure; and also because the wine of 1861 is of a superior quality, and will not be made into brandy.

The expenses of transportation are not incurred on account of tolls or bad roads. The highways in France are all macadamized or paved, always kept in good order, and utterly free of toll-gates. Turnpikes are free also. They are kept as well as anywhere else. Therefore the cost of transportation is to be ascribed solely to the bulk and small value of the merchandise.

To solve the difficulty farmers in good or moderate circumstances established their distillery at home. An apparatus is to be found in every cottage and almost in every house of certain villages within the most prosperous districts, such as are found around Cognac, La Rochelle, Montpellier, Cette and Narbonne, in the south.

Remote, poor villages and farms have the occasional advantage of a transient, portative distillery, working on shares, and producing tolerable or even good brandy. The observer cannot fail to be surprised at the positive fact that no one drinks brandy in the districts of production. Should a confirmed, foreign drunkard happen to traverse that country he would give his preference to wine, and thereby avoid intoxication. Such is the daily repeated experience which is practiced upon northern soldiers. At home they get drunk with northern whiskey or southern brandy. When in the south, or even in Paris, they abandon alcohol, try to get drunk on wine, and find it very difficult to succeed.

The foregoing assertion may seem somewhat heterodox to zealous partisans of the "Maine liquor law," because it implies that wine cures drunkenness and does not cause intoxication, but it can be sustained if the statements of some respectable writers are to be credited.

The stomach is a distilling apparatus. When acting on strong alcohol it produces ether, and the phenomena of etherisation, that is, at first agreeable sensations, next unconsciousness, and sometimes death.

Therefore, moral advantages as well as profit may be expected from an expanded cultivation of the vine in America. Every farmer ought to have at least one acre of vineyard, which would grow everywhere in Ohio, and with "proper care" would yield a sure crop of ten barrels of wine. This would afford a beverage appropriate to our dry climate, and costing less than tea and coffee, which might be used as a delicacy, like in Turkey, France and Italy, and not as a beverage, in imitation of swampy Holland, sunless England and polar Russia.

Fresh grapes are constantly found in French markets from August to Christmas. During the months of September and October choice qualities only find favor, and are obtained at half a cent per pound. Then city people lay in their winter stock. Some of them spread the bunches on clean straw, distributed on shelves around capacious rooms; some others hang them in strings which are nailed on rafters or poles. They make also large quantities of grape preserves, the usual process being merely to boil down the berries to the consistency of syrup; and this is so sweet that quinces, pears and other fruits are perfectly preserved by an immersion into that syrup.

Superior, unripe grapes are generally selected by poor peasants to make preserves. To avoid deterioration and correct the natural acidity of such preparations, an addition of carbonate of lime in the juice is necessary. This must be followed by decantation and filtering through a sieve or coarse cloth.

To the monks of the middle ages France is indebted for the enjoyment of her precious vineyards. These pioneers of European civilization, in order to plant and propagate the vine, were obliged to clear the immense forests which then covered the soil of France. Continued wars and increasing populations contributed to the almost total destruction of forests. At the present time immense quantities of choice timber are employed in the construction of powerful navies and extensive railroads. Rough oak is sold at $24 per cubic yard, and will soon fail unless the present state of things be changed.

A law was recently enacted by the representative assembly of France, which appropriates ten millions of dollars for planting forests. The extent of land to be planted is about fifty millions of acres.

Such an undertaking will be the work of a century, and will cost untold sums of money. But they seem to be in earnest, and the work is fairly in progress. Thousands of acres are already planted. Private individuals, communities, townships and government are planting wood on their own lands. Compulsory means, or the law enforced, against the reluctant, the poor and the sluggish.

Poor villages hold in common certain tracts of mountainous or of marshy lands which are used as pastures. They are reluctant to loose the pasture, and unable to plant. In cases like these the law provides that the government shall lend the money to the corporation, to enable them to complete the improvement, or take possession of the land and have the work done ex-officio.

Different systems are followed in the prosecution of this gigantic work—rich lands are planted in rows with the best kinds of oak—poor lands are *sowed* with pine. Some proprietors having planted their waste lands publish the result of their experiments. The "Journal d'Agriculture Pratique" contains the mode of proceeding, and the following account of a plantation, which was made in 1831:

| | |
|---|---|
| Cost of one hectare (240 acres) of land, $10.00 | 50 francs. |
| Cost of 10,000 pine plants at 5f. per 1,000 | 50 " |
| One day's planting, 1,000, at 2 50 per 10,000 | 25 " |
| One day's planting for boy, 1,000, at 1.30 per 10.000 | 13 " |
| | 138 |

| | |
|---|---|
| This capital, with interest at five per cent., being accumulated during thirty years, amounts to | 614 55f. |
| Cost of forest guard in the proportion of 0.50f. a year | 15 |
| Cost in total | 629 55f. |

PRODUCTS.

| | | |
|---|---|---|
| Rent for pasture four years, at 5f. | 20 francs. | |
| Sale of buds (for medicine) six years, at 10f. | 60 " | |
| 1st, clearing 15th year 4,000 trees, at 0.06f. | 240 " | |
| 2d, clearing 20th year 2,000 trees, at 0.30f. | 600 " | |
| 3d, clearing 25th year 1,900 trees, at 0.80f. | 1.520 " | |
| 4th, clearing 30th year 100 trees, at 2.00f. | 200 " | |
| Value of seedlings, natural growth | 100 " | |
| Value and improvement of the soil | 150 " | |
| Hunting rent, at the rate of 0.30f. a year | 9 " | |
| | | 2 899f. |
| Profit | | 2,270.55f. |

From which it appears that France must actually pay at least three hundred and fifty millions of dollars for having her woods replanted with the cheapest pine.

These extensive plantations will soon bear an influence on the climate of France, such as to improve the production of her cultivated lands. Instead of the present alternation of droughts and freshets, the valleys will receive regular, genial rains, which, keeping the streams well supplied, will also afford the means of artificial irrigation.

At the present time irrigation is an absolute necessity in the middle and southern districts of France. Wherever it is applied its effects are indeed considerable; orchards mature an abundance of fruits; meadows yield five and six crops of hay; vineyards, in some instances, produce as much as four times the average quantit of wine; and vegetable gardeners reap three or four crops from the same ground in one year.

Bread, fruits and vegetables constitute the almost exclusive diet of the southern populations. Cities, towns and villages are surrounded by extensive vegetable and fruit gardens. Each of them is supplied with a system of irrigation which is kept working at night. When there is no available fall the water is drawn up by means of horse-power and machinery, sometimes it is a chain pump, but in general the old Arabian "Noria" system of wooden wheels. Wealthy landowners sink artesian wells, some of them have as many as five or six artesian wells, to water their estate. Factories resort to the same means in order to supply their boilers with water.

The country around Marseilles was dry, parched and almost like a Sahara. An extensive canal was constructed to join an Alpine stream. The country became green and prolific; and, besides, the city of Marseilles was provided with beautiful water-works like those from Croton to New York.

The chain of the Pyrennees mountains is almost a bare rock. Very few streams emerge from their sides, and these are mainly supplied by the melting of winter snows. So that when the snow is melted, after the first days of the summer, all the streams are either low or dry. Of course every thing withers in the valleys—grist mills are still most of the time—and this is a great inconvenience for populations whose principal food is bread.

The extensive and populous valley of Adour, which opens towards Bayonne, was periodically afflicted with total want of water for irrigation during the summer.

A natural lake, several hundred feet deep, was known to exist on the top of some distant mountains. To ascertain the depth of the lake, to dig a canal underneath, and tap the bottom of the lake by submarine blasting, after having established below an immense brass spout to regulate the stream, such were the means employed by the present government to supply a single valley with a system of irrigation.

The French code of laws contains an extensive and elaborate section devoted to the regulation of streams, lakes, canals, sewers and drainage. The general principle of the law is to favor agriculture. Grist-mills must suspend their work at night when the water is wanted for irrigation.

# SERVICES RENDERED TO AGRICULTURE BY CHEMISTRY.

To plow the land, enrich it with manure, to sow it with seeds, then await with patience until nature has accomplished the mysterious work which causes the plants to spring from a germ, grow, blossom, and produce fruit—such would be the part of the agriculturist, if he were unable, by means of chemical analysis, to ascertain what are the constituent elements of the land best adapted to the crop which he wishes to obtain; also, how it may be possible to complete the series of these elements by manure of some well known composition; and finally, what agent may either facilitate or hinder the formation and accumulation in vegetables, of such ingredients as are particularly sought after, on account of their usefulness, either for the food of man, or for the satisfaction of his numerous and insatiable cravings.

As soon as chemistry had acquired the means—even imperfect, as they were—of decomposing bodies, the agriculturist demanded from it the secret of the fertility or barrenness of his lands; that was more than chemistry could answer as yet. But subsequent improvements in the analytical process of the laboratory, produced the happiest influence on agricultural practice. Vague notions, based only on uncertainties, as mere physical properties of the lands—as to their state of division; their permeability; force of cohesion in the particles; their ability of absorbing heat—soon gave place to positive precepts on the proportion of aluminium, free or combined flint (silex), carbonate of lime, oxyde of iron, and several other compounds; the absolute necessity of which was demonstrated by clever experiments, in order that all the marvels of vegetation may peruse their admirable phases, from the sprouting seed to the reproduction of the germs.

At first, things appeared extremely simple; it was thought that the elements useful to vegetation could be reduced to a small number; but it was soon discovered that the simplicity of the laws thus ascribed, were able to explain but a small part of agricultural phenomena, whilst others, perfectly evident, remained unexplained and wrapped in the most complete obscurity. As, for instance, two soils, of a very different productiveness, seemed to possess the same proportion of clay, sand and lime, when these were the only constituents of fertile lands under consideration. Therefore it became necessary to pursue new investigations.

Since the commencement of this century, the record of the progress in analytical chemistry is very closely connected with the history of agricultural progress. The number of fixed elements which have been named minerals, and are known to be useful or necessary in all fertile lands, has become considerable, in proportion as it was discovered that the presence of the combustible or volatile principles, ascribed to an organic origin, were all important.

Should we consider, in cultivated soils, only the simple elements of which they are composed, we would find at the utmost sixteen only, viz.: Carbon, oxygen, hydrogen, nitrogen, phosphorus, sulphur, silicium, chlorine, iodine, potassium, sodium, calcium, magnesia, aluminium, iron and manganese. But (how wonderful!) simple bodies, in a state of isolation, except one of them, seem to have no influence on vegetation. It is in a state of binary, ternary or quarternary combinations, that they become useful elements—that they supply plants with food—that they are assimilable to vegetables. When "Lavoisier" proved beyond cavil that the atmospheric air was composed of oxygen and nitrogen, he commenced a great and salutary revolution in agriculture. Oxygen is the only simple element which acts directly and of itself on vegetation; it is also the only simple body which plants exhale.

Following up the metamorphoses of the oxygen, when it fixes itself sometimes in combination with the carbon, or the nitrogen, and sometimes with the ferruginous or sulphurous compounds of the soil, Bonnet, Scheele, Priestly, Ingenhousz, Senebier, and especially Th. de Saussure, were able to explain the growth of plants in carburetted matter—to find out the admirable action of light in the decomposition of carbonic acid gas, and the exhalation of oxygen by the proper organs of vegetables.

At the same time, and as one of the greatest harmonies of nature was revealed to man, who saw with admiration plants restoring to the aerial ocean, the element indispensable for the support of animal life, a positive foundation was given to the theory of plowing, the efficacy of which is no longer limited to mere mechanical action; now, the human mind was led to the explanation of a new process, the discovery of which greatly contributed in asserting the authority of science to the conviction of the rural population; that is to say, drainage by means of earthen pipes, systematically placed in the subsoil, so as to favor the circulation of air and water through the tillable strata.

The first drainage works were contemplated with scornful incredulity by the peasantry; the success of this device, which rests on the action of well defined chemical affinities (as Mr. Chevreuil first demonstrated it), was fortunately prodigious. Cultivators beheld and were convinced. When science has won such victories, it has the right to answer "utilitarians" who ask, what is the use of theories? "No fact, when ascertained, ought to be neglected; a good chemical analysis may, perchance, be pregnant with an immense progress."

A knowledge of the active part which oxygen plays in agricultural phenomena, naturally led to inquiries as to the inertia which is presented by the other gas, inasmuch as its proportion is four times greater than oxygen. The presence of nitrogen in all vegetable and animal bodies; its accumulation within seeds and all vegetable substances the most nutritious either for domestic animals or for mankind; its incontestable scarcity within the rocks which form the frame of our globe, suggested the idea that possibly some plants draw nitrogen from the air. But, all investigations made with the view of changing vague surmises (for such cannot satisfy science) into positive certainty, failed to demonstrate the direct assimilation of nitrogen from the air by plants. However, the first views of the "savants" who investigated this important problem were not entirely erroneous. It is generally admitted, at the present time, that the nitrogen which is found either in living bodies or in the deposits formed after death, was originally derived from the aerial ocean wherein all terrestrial creatures are immersed.

Before reaching plants, the nitrogen of the air is transformed. It is ascertained that a soil, without receiving any manure, acquires within a certain time, noticeable proportions of nitrogen; and also that a fallow ground obtains more of the same nitrogen than can be accounted for from rains and meteoric phenomena.

The process of fixing into the soil the nitrogen from the atmosphere is not as yet completely explained. Is ammonia produced by the combination of the nitrogenous gas dissolved in water, when ferruginous compounds of the soil become peroxyds, in the same manner as ammonia is produced when the rust of iron is formed? Does the incontestable nitrification of the mould take place, not only by means of the pre-existing nitrogenous compounds, but also owing to a certain quantity of atmospheric nitrogen which might combine with oxygen from the air, under the mysterious influence of porosity? The particular state of oxygen, which is known under the name of "ozonised oxygen," and also atmospheric electricity, might explain the direct formation of nitric acid by means of the nitrogen from the air, without the help of any nitrogenous organic matter.

Whatever solution the above questions may receive, chemistry, by showing that the nitrogen from the air is at the utmost a distant source for vegetation—by directing attention to the importance of manures that contain nitrogenous substances which are easily decomposed either into ammonia or nitric acid—chemistry, we say, rendered to agriculture one of the greatest services, which the gratitude of mankind will forever ascribe to Boussingault and Payen. They proclaimed this true, axiom-like maxim, "*that manures are useful, in proportion as they contain nitrogen;* their table of equivalents on manures, will remain as a monument of precision, which shall prevail, notwithstanding sundry objections; as, for instance, that nitrogen is not the sole efficacious principle in manures; or, as in the case of doubtful trials, that manures, highly impregnated with nitrogen, did not produce as good results as some mineral substances which contained but little nitrogen.

Chemistry did not deserve the reproaches on that score, that some persons have presumed to utter; never did chemistry, or the masters of chemistry, proclaim the exclusive preponderance of nitrogen. There is not such a thing as an absolutism in manures; there are only relative manures which are the *complimentary richness of the soil,* as Mr. Chevreuil expressed it. Any thing which brings into a soil an element that was wanting and which favors vegetation, is manure. The divers useful principles must be in certain harmonic relations, one to another; an excess of a good element may become hurtful; when a soil is sufficiently manured, an addition of the rich matter is not followed by an increased crop, unless the primitive constitution of the soil be changed by deep plowing, drainage, or any other manner.

At the same time that chemistry gave to agriculturists a kind of standard with which to measure the relative value of divers commercial manures, it supplied a method of easy and rapid analysis, by means of which we are able at present to ascertain, without much trouble or expense, the richness of manures, in a great number of public laboratories which the Government's officers have established in the provinces and provided with necessary implements.

It is proper to recommend to persons who attempt a chemical analysis, to act with the discrimination of practical chemists, and not to expect from the method more than it can really indicate. Thus, some easy methods of analysis do not show in manures the nitrogen which they contain under the form of nitrates; and nitrates are, however, highly fertilizing, as was proved in England twenty five years ago by repeated trials. In testing manures, no one should by any means neglect phosphorus, which is there, in most cases, engaged under the form of phosphate of lime. Phosphorus, in an absolute point of view, is not less useful than nitrogen, although it be wanted by plants in lesser quantities. During the last forty years, crushed bones were used in large masses by agriculturists. Either burned or raw bones are very efficient, in lands which are highly impregnated with vegetable matter, and, being recently cleared, have not received marl or barn-yard manure.

Humphry Davy ventured, in a dubious form, the following opinion: "Phosphate of lime is probably necessary to wheat and other grains; it would seemingly be useful to lands overloaded with vegetable matter." This foresight, emitted with that wise prudence which is the stamp of great observers who foresee, but affirm nothing beyond stated facts, is to-day changed into irresistible truth, thanks to numerous and decisive works of Elie de Beaumont, Boussingault, and Payén.

When Dr. Buckland had discovered fossil phosphate of lime in England, the importance of phosphorus in vegetation was elucidated by Mr. Berthier, to whom a French agricultural society was pleased to grant a large gold medal, as a due reward for his long, patient and very precious analysis. At present, phosphates are sought after with great eagerness through the whole world; they constitute for commerce a branch of considerable activity, and for agriculture a new cause of prosperity. When the ideas became more precise on the true manner of the action of manures, the investigation of the chemists indicated to agriculturists the profit that could be derived from a great number of residuous objects, which were disdainfully rejected, or piled up into useless or noxious heaps. A large quantity of residues, heretofore encumbering factories or thoroughfares of large cities, now go to enrich the lands upon which they are spread. Mines of manure were found and worked up with the same ardor as mines of coal and metal. Deposits of guano are no longer in the exclusive estimation of the barbarous populations of

South America; the use of that precious article is limited, in Europe, only by the excessive price which it obtains from the monopoly of the Peruvian Government.

It would be an injustice not to notice here, that the first samples of guano, brought into France by Alexander von Humboldt, on his return from his great voyage to the equinoctial regions, so profitable to the advancement of science, were analyzed by Fourcroy and Vauguelin, in 1806. These men did not fail to show that guano was mainly characterized by a large proportion of urate of potassium, urate of ammonia, and phosphate of calcium; that is to say, by nitrogenous and phosphoric principles, which science now proclaims as the certain tokens indicative of the best manures.

From the first advances of analytical chemistry, the elements contained in the organs of either plants or animals, were submitted to attentive investigations which did not cease to be pursued with perseverance, being encouraged by beneficent consequences derived therefrom. Thus chemistry shed a brilliant light on the phenomena of the life of organized beings; on the laws that govern the eternal movements of matter, revolving from the soil to plants, thence to animals, and returning to the soil whence it originated; taking sometimes the form of gas, now assuming the shape of dust, in order to be disseminated by the winds all over the surface of our planet. The chemical statistics of organized beings, the elements of which were revealed first in the works of the great Lavoisier and of his disciples, have since been established with admirable precision, in a celebrated and eloquent lecture of Mr. Dumas.

But the influence of chemistry on Agriculture is not merely to be appreciated by so great services as were bestowed on the progress of human sciences, in the greatest and most difficult problems concerning the physical structure of the earth, and the physiology of vegetable or animal life. By discovering the immediate principles which are met with in divers vegetables, chemistry gave birth to various industries; the prosperity of which impelled the progress of agriculture, and afforded competency to an immense number of rural factories. It is enough to name sugar, oil and alcohol, and to recall to public gratitude the works of Chaptal on beet sugar; the transcendant discoveries of Chevreuil on the principles which are derived from oil and grease; the useful researches of Parmentier and Cadet de Vaux on potatoes and other vegetables containing starch; and, finally, the remarkable and persevering investigations of Mr. Payen on the growth and secretions of plants. Lands assume a greater fertility, yield more wheat, nourish more stock, wherever sugar, starch, oil or alcohol are manufactured. Chemistry has shown, indeed, that by exporting only these manufactured articles, the farmer takes out from his soil nothing but carbon, oxygen and hydrogen; that is to say, the elements that almost never fail in his land; whereas he allows to remain, under the form of residues which constitute the manure, an excellent food for his stock, such as beet pulp, distillatory residues, and oil cake; these retain all the nitrogen, phosphorus and potash—in a word, all the principles, rare or expensive, and yet indispensable to form meat and manure.

The prosecution of the study on the immediate principles of vegetable and animal life, will doubtless obtain precious results, the importance of which, though impossible to be exactly measured beforehand, may at least be judged from the already-acquired results. The sciences of observation do not stop; they never reach the end of their career; it is the providential destiny of mankind to be urged on the way of discoveries, by the assurance that they will find, "querite et invenistis."—*Matt.* vii. 7. Therefore, in the whole circle of its applications to agriculture, whatever studies may have been its object, either soil, manures, plants or animals, chemistry attained so many discoveries, that its history is intimately linked to the annals of the progress of rural economy.

Even since the close of the last century, the association of chemistry with agriculture has been the subject of a treatise, published in England, by Count Dundonald. A chair of agricultural chemistry was then occupied in Edinburg by Rennie. The illustrious savant who discovered potassium, sodium, and so many other simple bodies, Humphry Davy, published an admirable "Treatise on Agricultural Chemistry," which was thrice translated into French; this work belongs to that class of writings that will always be read, and which challenge the gratitude of mankind to such names as Cato, Varro, Columella, Olivier de Serres, and Mathieu de Dombasle.

Every one knows that Chaptal is the author of the first treatise of chemistry applied to agriculture ever published in France. Ever since, works of that kind have been numerous; they are eagerly read by agriculturists, who constantly demand from chemistry new information, in order to be guided in their trials. At the same time, a great number of professors attract around their chairs crowded auditors, who are happy to find in chemistry a powerful incentive to search into the secrets of Nature. (In France, these professors are Boussingault at Paris; Malaguti at Rennes; Girardin at Lille; Isidore Pierre at Caen; Baudrimont at Bordeaux; Ladrey at Dijon; Bobierre at Nantes; Houzeau at Rouen; they teach public courses of agricultural chemistry, free admission. Those of Germany and England are on a different basis.) All these savants vie with each other in making the most progress.

Lavoisier, the legislator of modern chemistry, proclaimed the immense part acted by atmospheric oxygen; he published, with Clouet, a work on the production of saltpeter, which contains the substance of all the recent discoveries on the nitrification of tillable soils.

Vauguelin perfected a great number of investigations and analyses on the sap of vegetables; absorption of lime by plants; animal bones; disease of trees; animal urine; milk; guano; germination and fermentation of seeds and farina; and many other subjects concerning agriculture.

Fourcroy was Vauguelin's colaborator in a great number of investigations in agricultural chemistry.

Chaptal is the author of a treatise of chemistry applied to agriculture; of several "Mémoires" on beet-sugar, fermentation and distillation of wine; also of a great treatise on the cultivation of the vine, and the art of making wine, brandy and vinegar.

Cadet de Vaux published a system of preserving wheat crops in rainy weather; also researches on farina, potatoes, wine and fermentation.

Darcet the elder studied limestones and their decomposition by heat; Darcet the younger published numerous and useful works on the diseases of the silkworm.

Van Mons made chemical researches on plants, and was a celebrated pomologist.

May the remembrance of these men, whose discoveries won to their names an immortal glory, protect the future of agricultural chemistry, and indicate to all that the study of pure sciences is the noblest and most glorious career, and that their application to agriculture is a benefit to mankind.

# THE MECHANICAL CONDITION OF THE SOIL FAVORABLE FOR THE GROWTH OF SEED.

BY PROFESSOR TANNER.

## PRIZE ESSAY.

The cultivator of the soil will find in the preparation of the land for the reception of seed his most laborious duties and those which demand his greatest judgment and skill. When these are accomplished he has, comparatively speaking, little else to do but to commit the seed to the ground, leaving the work he has carried thus far to be completed by the secret operations of Nature, directed by His will who established the law that seed-time and harvest shall not fail.

Plants, having passed through several stages of growth and performed the earlier functions devolving upon them, have the last but most important duty of life reserved for the period of their greatest perfection and beauty. This duty is the formation of seed, endowed with powers capable of reproducing plants similar to those by which the seed has been formed. In the seed we have one of the most interesting examples possible of the wise provision made for the perpetuation of the various forms of vegetation. In it the powers of vegetable life lie dormant until aroused by the conditions favorable for their development, and when these are present the seed forthwith springs into action and growth. In speaking of vegetable life we naturally associate with it the co-operation of some mysterious power, by which the vital energies of the plant are stimulated to action; but although we cannot fully understand the primary principle of life, yet an examination into the changes which take place in the growth of seeds will remove much of the mystery which is often attached to it. To this end we may take the seed of wheat as a familiar specimen for our examination. It is particularly worthy of notice that the seed consists of two distinct parts—the germ, which is the true seed; and the nourishment stored for the growth of the germ. The position of the germ is indicated by a sear or cicatrix upon the skin, but it is a minute body and forms but a small proportion of the entire seed. It is always placed adjacent to the bulky portion of the seed, consisting of starch mixed with gluten and albuminous matter, and the whole is inclosed in a coat of dense vegetable matter.

The growth of the seed consists in the development of the germ into a perfect plant, and is known as *germination*. Supposing the conditions of growth to be favorable, the first preliminary is a softening of the coat of the seed, by which means water gains an entrance, and having pervaded the mass causes it to swell freely. When the water reaches the germ of the seed the gluten or albuminous matter near to it undergoes a chemical change, and we have a very important and powerful body formed which is known as diastase. Whether or not the germ in any way participates in this change, we have no proof; but, if not, it is certain that at least by its presence it exerts a controlling power. The same addition of moisture to any other portion of the seed would not produce the same effect, for this agent (diastase) is only found in close proximity to the germ, and its existence in the seed appears to be simultaneous with the first stage of germination. Upon the diastase thus formed devolves the important office of preparing food for the growth of the germ; for the bulk of the seed, although abundant in quantity and exactly suitable in its constituent elements, is not ready for use until it has become soluble in water, and thus been made capable of entering into the circulation of the germ. This is accomplished by means of the diastase, by the agency of which the necessary supplies are prepared, so long as the store of food in the seed is needed. An immediate extension of the cellular matter accompanies the entrance of the food into the circulation, and we have external evidence of life by the sprouting of the seed. In whatever position the seed may be placed, the radicles at once strike perpendicularly down into the soil, and the tender rootlets fix themselves there with but little delay. As soon as this is effected, the gemmule grows in the opposite direction and becomes developed into the stem and leaves of the plant.

The conditions which control the growth of seeds are, the presence of air, moisture, and warmth; and, to produce healthy germination, all are required in definite proportions. When seed is protected from these agencies it will retain its powers of growth for long periods of time. Thus, wheat, preserved in Egyptian mummies between 3,000 and 4,000 years, has, after that lapse of time, germinated and produced a large increase. The preservation of the power of growth is entirely dependent upon the seed being kept from those agencies which would excite its vital energy: moisture is the first essential for germination, as it is in consequence of the chemical action excited in the seed by the entrance of water that the seed is aroused to action; and after this process of growth has been excited, if it become checked, it cannot be renewed. This shows the necessity of keeping the seeds dry when they are not required to germinate. Moisture alone is not sufficient for this process of growth, as the seed requires a supply of atmospheric air to enable the necessary chemical changes to proceed. Stagnant water in the soil must of necessity be unfavorable to germination, because it renders the land cold and excludes the free access of air, both of which conditions are prejudicial.

The exceptions to this rule are very few: one, however, may be found among agricultural seeds in the floating sweet water-grass (*Glyceria fluitans*), grown in our water-meadows, in which instance immersion in water is absolutely necessary for the growth of the seed. In this case we have a seed which has the power of extracting its supply of air from water—a power which but very few other seeds possess. The supply of air is as necessary for these aquatic seeds as for any others; for if we drive out the air from water by boiling, they can no longer germinate. For the same reason, seeds which are buried deeply in the earth remain there for many years, not because they want moisture, but because it is unaccompanied by the presence of atmospheric air. The earth raised from wells, or brought from railway cuttings, or plowed up by a furrow of extra depth, often becomes covered by a growth of vegetation, the produce of seeds which have long been dormant in the soil.

Warmth is another essential condition for germination, which, within moderate limits, is rendered more rapid by an increase of temperature; but it must be accompanied by a proportionate increase of moisture, otherwise it becomes destructive. The action of heat promotes chemical changes in the seed, but a free supply of water is necessary, not only that it may exert a like chemical influence, but also because it enters largely into the more delicate body into which the dry matter of the seed has to be transformed. Thus we see that healthy germination depends upon the combined action of the three agents—heat, water, and air.

The opinions which are entertained respecting the influence of light are conflicting. Some consider that light retards the process of germination, whilst others consider that it does not influence it prejudicially. The experiments which have been made, although far from conclusive, are calculated to favor the former opinion; for the growth, although equally perfect, has not been as rapid under the action of light as when the seed has been covered from it. We know that, as soon as the seed has made sufficient growth to throw out its leaves, the action of light is favorable, its presence enabling the plant to decompose carbonic acid and to retain the carbon for its own, whilst the oxygen is thrown off into the air. But at this earlier stage of existence, or, in other words, during the period of germination, growth is favored by an action *just the reverse* of this. The seed and its sprouts want to absorb, not to throw off oxygen, and to emit instead of taking in carbonic acid. During germination, then, the action of light would tend to paralyse the vital powers of the seed, and limit its growth to the hours of darkness, instead of allowing the development to be continuous. Another great advantage gained by covering the seed is the more equable supply of moisture which is preserved beneath the surface, as well as the better opportunity afforded to the roots for firmly fixing themselves in the soil.

After this hasty glance at the general principles involved in the germination of seeds, we may proceed to notice the special requirements of the various crops which come under the care of the agriculturist, and to describe the preparation of the land which is most successfully adopted in each case. It may be as well for me to remark, that although the *composition* of the soil is an essential point in the preparation made for each crop, yet it does not come within the scope of this Essay to notice the means by which we regulate the presence of those fertilizers which are necessary for luxuriant growth.

*Wheat.*—The mode of preparing land for being sown with wheat will be regulated by the previous cultivation it may have received and the natural character of the soil. The heaviest clay soils are generally prepared by bare fallow: this plan being found, in the majority of cases, productive of the best crops of corn from this description of land When this plan is properly carried out, the tillage which the field receives brings it into a nice condition for the seed-wheat to make its growth. Close and adhesive as these soils naturally are, it has been found necessary to adopt a method of cultivation by which the character of the soil shall become thoroughly changed. Under the action of a properly-managed fallow the soil becomes broken up by the frosts, baked by the sun's rays, and crumbled again by the fall of rain ; and these influences, combined with the inversion and intermixing effected by implements employed upon the land, change it from being close and adhesive in its character into the condition of a well-broken soil fitted for the growth of seed.

There is much difference even amongst heavy clays as to the degree of fineness to which it is desirable to reduce the soil whilst under fallow; but the general feeling is that the soil should not be rolled, so as to bring it into a fine state, unless the land is foul and it is necessary to give the seeds of any weeds which may be in the soil a better opportunity of growth. Even then it is considered that we run a great risk of getting the soil pasty or muddy when rain falls upon it ; and, unless under the circumstances named, it is better to keep the soil in a state of small lumps rather than reduce them into a dusty condition. The same care is necessary in preparing it for the seed wheat. The last plowing should leave the land in ridges, and the plowed earth should not be broken down or crushed until the time of sowing.

An early preparation of these soils is advisable, so that the work may be accomplished whilst the soil can be thrown together in a dry state, after which it may remain untouched until the seed-time. Narrow lands will generally be found best for soils of this class, so that, in carrying out the sowing, the drill and harrows may cover the width between the two furrows, and the horses walk in the furrows, so as not to trample the land. If a fallow has been well managed, so that the land has been thoroughly cleaned from weeds, in case of a wet seed-time, I should have no hesitation in sowing the land broadcast, rather than wait to drill the seed with the risk of injuring the condition of the land and the certainty of delaying the time of sowing.

Clays of this strong character are exceedingly sensitive of moisture. They rapidly absorb it from the air, and when the rain falls, the interstices in the surface soon become closed so as to obstruct its passage. If, whilst the soil is in this soft state, it be pressed, a firm adhesion of the particles takes place. The cups thus formed in the soil by the horses' feet continue to hold water long after the other ground has become dry. The clay soil, which expanded when it absorbed water, is disposed to contract again as it dries, whilst the adhesion formed by pressure still remains. If this adhesion is objectionable to the growth of the seed, as I shall show it to be, it ought to be avoided ; and for this reason the sowing of such land should be carried out as early as the climate of the district will permit, and the greatest care should be taken to avoid the injurious influence of treading the soil or pressing it by the use of implements, which may cause its adhesion. Few can at present estimate the full amount of injury occasioned on these soils by the treading of horses on their work—an injury which probably will only be rightly estimated when we supersede this portion of their labor by steam cultivation.

After the seed is sown, the harrowing must only be carried out so far as to cover the seed, for the reduction of the surface to a fine tilth is very objectionable; rolling should certainly be avoided. The injurious effect of a fine surface arises from its disposition, in case of violent rain, to form a muddy coating, which, when dry, acts as a crust upon the surface. This covering interrupts the free entrance of the atmospheric air into the soil, and thereby checks the germination of the seed, and renders it irregular. In the same manner, but in a greater degree, when, by compression, we get an adhesion of the soil, the seed thus inclosed is deprived of the access of air, and cannot make its growth. The stronger and more adhesive the natural character of the clay may be, the greater is the caution necessary to have it well prepared for the seed early in the season, so that it may be sown in good time, and the surface left in a tolerably rough state. These clods of soil will be a good shelter in the winter months, and, by the return of spring, will have mellowed down into a nice mould, valuable to the young plant when the important operation of spring-rolling is carried out; but care must be taken in doing this not to get on to the land too quickly. Now, although I advise that the field be left rough after sowing for the winter months, I must not be supposed to suggest a negligent mode of finishing the work of preparation; for I admire a neatly-finished field of corn, and look upon it as an indication of general good management. The surface may be allowed to remain rough; but, as soon as the implements have finished their work, the laborers should proceed to make clean and sufficient furrows and water-gutters, so as to prevent any lodgment of water upon the surface. This should be done whether the land be underdrained or not. Fertilizing as the passage of the water undoubtedly is, I would very much rather not retain it upon the land for this purpose during the winter months.

The next preparation for wheat we have to notice will be upon land which has produced a crop of autumn-feed or early roots—for instance, rape, vetches, cabbage, mangold, potatoes, &c. The soils upon which this system is adopted will be rather lighter than those we have noticed, so that we may describe them as medium clays. These terms are necessarily comparative and also much under the influence of climate; for a clay of medium character in a wet climate will require more careful management than a strong clay in a dry climate, and thus we often find an apparent discrepancy in evidence and opinion, when, in fact, persons are disputing upon circumstances which do not fairly admit of comparison. I have nothing to say here on the question whether for a strong clay a bare fallow is preferable to a crop of autumn-food, or otherwise; I will only observe that the majority of the occupiers of strong clay lands, who argue against bare fallows as unnecessary, live in the drier climates of England, where the difficulties arising in the management of such clay soils, are much reduced. I prefer, however, to take the course of cropping as it may exist, and therefore, without further comment, proceed to notice the preparation of wheat upon clay soils after an autumn green-crop or beans.

As these crops admit of a system of hoeing being carried out, the land will not have much weed upon it when the crop has been removed, but may be supposed to be in good working condition; the early operations may differ according to the nature of the preceding crop, but they again meet when the surface has been cleaned. After beans the land may be better for being skimmed and having the weeds burnt; but, should the ground be too hard for this to be readily done, the use of the plow will be preferable, which should be preceded by forking and picking any couch-grass that may have established itself. The surface should be cleared of any weeds (except annuals) which may be there, and then the more immediate preparation for wheat-sowing will commence.

A single plowing is enough for getting the land into good order, if summer-tillage has been satisfactorily carried out. The vetches, rape, and part of the cabbage will be generally consumed upon the land, and thus it will often happen that the rain falling upon it will cause the surface to become hardened by the treading of the stock; but if, from this or any other cause, the land is too hard and incapable of being prepared by one plowing, then a second plowing must be given, and, if possible, 10 or 14 days should elapse between them, so as to let the soil regain the necessary degree of firmness for the seed.

Wheat, whilst it requires the necessary supplies of air and moisture for its germination, cannot flourish unless it can root firmly, and it is for this reason that, where one plowing will do, it is always desirable to avoid a second immediately before the sowing.

It is seldom any matter of difficulty, when dealing with clay soils, to secure the necessary degree of firmness, although after vetches the land is sometimes disposed to be puffy in its condition; this is, to a great extent, corrected by the treading of sheep, when the crop is consumed upon the land; but, when one plowing is enough, the natural cohesion of the soils will generally secure a sufficient firmness in the land.

When wheat has to be sown after an autumn-crop of green food upon light land, the firmness of the soil requires to be carefully attended to. It is generally objectionable for wheat to be sown upon this plan in the southern districts, though in the north of England it is frequently practised, but then measures are adopted to consolidate the land. The crops of autumn-food, which generally precede wheat on light land—viz, rape, turnips and rape, and common turnips—are always consumed upon the land by sheep, and the great point, after plowing the land, is to follow with a land presser, and give it time to gain firmness before the wheat is sown; when this firmness cannot be gained naturally, sheep are often turned upon the field to tread it thoroughly. This, although answering the purpose exceedingly well, cannot be looked upon as a satisfactory plan; but it must be admitted that no rolling produces equal firmness. When this difficulty continues, notwithstanding that the press-roller has been used, and time given to the land to settle, so as to sow upon a stale furrow, the better remedy will often lie in a change of the course of cropping, so as to sow upon a clover-ley, which is decidedly the more frequent and desirable preparation for wheat on these light soils.

There appears to be a strong objection to ley-wheat in some of the northern counties, and, in such cases, the only remedy will be to sow the land whilst it is wet, as this can scarcely fail to give it all the firmness which is required.

The great advantages of clover-ley for wheat consists in the firm furrow which can be turned over when it is plowed, to promote which object our best plows effect the inversion of the furrow, without materially breaking it. Upon clay soils, and even upon strong loamy soils, a careful plowing of the clover-ley is found to produce a sufficiently firm seed-bed for the wheat, especially when it is allowed to lie for some time to get settled, so that the seed may be sown upon a stale furrow. The use of a share or skimcoulter with the plow, as it assists in burying the turf more completely, is generally desirable, otherwise the clover is apt to spring up between the furrow-slices, which is very objectionable.

As the land gets lighter in its character, the well-known land-presser comes in as a valuable help. These implements are generally made with two pressers, which, following immediately after two plows, very completely compress the two furrow-slices turned over, and give the land the required solidity. I have frequently found it an excellent plan to use a small drill in connection with one of these pressers for sowing clover-ley, when the land is disposed to be rather adhesive in its nature, especially in wet seasons. Such land can often be plowed up quite dry enough for immediate sowing; but, before a sufficient breadth of it can be prepared for the day's work of a large drill, it gets too wet to be worked, and often has to lie a considerable time before it is again ready for drilling; whereas the use of one of these press-drills admits of the ground being pressed, sown, and harrowed close after the plow, whereby an early and good seed-time is secured.

Another important condition at the time of sowing is the degree of moisture present in the land. Upon clay soils I consider the seed should be sown whilst the land is as dry as possible: it will be sure to receive moisture from the fall of rain, but wetness in the land causes the particles of the soil to bind together, to the prejudice of the crop. As the soils get lighter there is less objection to working them when wet; in some cases, indeed, this becomes necessary, in order to give them the required firmness. It is not often in the south of England that a wet time is selected for sowing; but, when rain comes on after the work has commenced, I have known it to be continued until the soil was quite muddy, and yet no disadvantage has resulted; on the contrary, the plant has proved firmer on the portion sown wet than upon any other part. This, which may be safe upon one soil, will often be very injurious upon another *apparently* of the same character. Soils which have a sufficient proportion of sand or grit intermixed with them are thus preserved from that adhesion of the particles of the soil which would take place in stronger land, so that, in their case, the germination of the seed is but little delayed, whilst the treading of the land when wet, gives it a greater degree of firmness, and this is favorable to the stability of the plant. The lime which appears to separate those soils which are injured from those which are benefited by being worked when moist, is the proportion of sand or grit which the soil contains, and also the condition of the clayey matter with which it is mixed; and this can at present only be safely decided by local experience.

The rules which regulate the quantity of seed-wheat to be sown to the acre are simply these:—the early sowings require less seed, whilst for the later sowings the quantity should be gradually increased; and, again, as the soil and climate become more favorable to the growth of wheat, less seed becomes necessary. The first sowings will take 5 or 6 pecks of seed to the acre, whereas the latest will reach up to 8 pecks, and upon poor land it will range from 7 to 10 pecks: local experience must here also be called in, to decide as to the time of sowing, for it is impossible to lay down any definite rule which can be taken as a safe guide. That comprehensive word climate seems to regulate this point; for neither the character of the soil, proximity to the sea, elevation, nor any other individual influence, decides the practice, but that peculiar knowledge which renders local experience alone worthy of confidence *

The months of October and November embrace the sowings of our principal wheat districts, but we must extend our time from the middle of September to the end of the year to include all the sowings of autumn-wheat. Exposed situations, which require a strong and well-rooted plant to withstand the winter-storms, require an early sowing and a liberal seeding, and so also do soils upon which growth is slow from any other cause. The milder district of the West of England permits the sowing of autumn-wheat to be carried on as late as the end of December, for the almost unchecked growth of the winter enables the plant even then to get quite forward enough for making a good start in the spring.

The influence of soil upon the quantity of seed is accounted for by the fact, that on rich land more stems will be thrown up from each root, than if the soil be poor; and to make up this deficiency, and also to enable the crop more thoroughly to search for nutriment in the land, more plants are necessary; and a larger allowance of seed is the consequence.

The depth most desirable for the germination of seed-wheat depends upon the closeness or adhesive character of the soil. The seed should be placed in that position which will secure to it such a supply of moisture, warmth, and air, as will most rapidly promote healthy germination. It is clear that these conditions cannot be secured in soils of a different texture at one uniform depth.

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* If all that really constitutes climate could be duly taken into account, including excess of dryness on dry soils, of wetness on heavy soils; prolonged exposure to keen winds; alternation of hot days and frosty nights; sudden burst of summer weather, &c., with due allowance for the mechanical defects of the soil, its susceptibility under changes of temperature, and its limited straw producing power, as well as for possible injury from birds and insects, we might then base our practice on *knowledge* rather than *experience*, but the result would not be successful, if any one element had been overlooked in our calculation.—P. H. F.

Upon loamy soils of medium character we find the depth of about 1 inch superior to any other, but as the soil becomes lighter and more sandy in its nature the depth may be advantageously increased to 1½ or 2 inches. In a dry season, a less depth than 1 inch can seldom be looked upon as sufficient to secure to the seed a necessary degree of moisture; and a greater depth than 2 inches is not desirable, because the plant has then generally to raise itself in the soil so that its roots may commence their duties within a moderate distance of the surface. The mode of plowing in seed-wheat with a 3½ or 4 inch furrow is clearly wrong, for the wheat will not establish its roots in the soil at this depth, and the germination must necessarily be delayed in consequence of this increased depth. If I make any difference in the depth of seed upon soils of this character, I let the early sown wheat be deposited rather deeper than that which may be sown later, and my reason is because the early sowings have plenty of time for making their growth, and, therefore, a full depth insures a firmer root, whereas with late sowings this delay cannot be allowed, for the young wheat will then gain more by appearing more quickly above the ground; but even these variations in depth should not range more than half an inch either way. The lighter the soil becomes, the more important it is to sow at a considerable depth, as this favors the stability of the plant, and the stronger the land, the greater the necessity for keeping near to the surface.

The three modes of sowing wheat, viz., dibbling, drilling, and sowing broadcast, have each their respective merits and advocates. Dribbling is the system which most perfectly fulfills our ideas of the requirements of vegetable growth; but there are many difficulties in the way of its general adoption, from the large amount of manual labor required,' in consequence of the imperfect action of the implements made for this purpose. Drilling is the process which is most extensively adopted, and is decidedly the best and most economical mode of depositing seed-wheat. The great preventive to its more constant adoption is the fact that, as the implement is heavy, tender soils are injured by the traffic over the land in wet seasons, and these soils must have more time given them to become dry and ready for sowing; hence it often becomes desirable, in order that we may avoid a late seed-time, to sow the seed broadcast. The advantages of the drill are very great in the opportunity afforded for hoeing the land, but when the system of horse or hand hoeing is not practiced much of the benefit of drilling is lost. After the seed has been sown it should be covered by the use of the harrow, but the less the land is worked the better, and especially upon strong soils. The roughness of the surface will be rather desirable than otherwise, for protecting the wheat-plant during the winter-months.

For sowing spring-wheat the soil need not be brought to as firm a condition as for the autumn sowing, but the difference is only one of degree, and such as enables us at once to see the cause which renders greater solidity essential for autumn sowing.

When wheat is sown upon land which is not sufficiently firm, the plant fails in the severe weather of winter; on the other hand, when the seed has a more solid seed-bed in which to establish itself, the roots are enabled to become more fibrous in form and vigorous in action, and in this manner they obtain a secure hold upon the soil from which the winter frosts cannot dislodge them. The great necessity then for a firm seed-beed for autumn-wheat is to insure the stability of the plant during the winter; consequently there need be no surprise that in spring we are less anxious about our land-pressers

The preparation of the land in spring for wheat is therefore far less troublesome than in the autumn. After the roots have been removed from or consumed upon the ground, the land is once plowed and a favorable opportunity taken for sowing it in due course, when the soil is in dry working-order.

A second plowing is seldom given, for the reasons I assigned when speaking of the autumn-sowing. Early sowing is important for this description of wheat, and as a rule none, excepting the April wheat, should be sown later than February in the eastern, and March in the western districts of England.

*Barley.*—The soils in which barley flourishes most luxuriantly are free-working loams, and it is by no means uncommon for such land to be distinguished as barley-land. This preference arises from the natural habit of growth in the barley, which requires a considerable freedom of action for the development of that bunch of fibres of which its root consists. In the preparation of land for its growth this has to be remembered; for, if the character of the soil is not naturally of the description required, we are compelled to adopt measures for rendering it as much so as possible. The firmness which was so necessary for wheat is objectionable here, and the more completely it is destroyed the better.* The course of procedure will depend upon the nature and the quality of the land. It is very seldom that barley is now cultivated except after a root-crop, and I shall presume, therefore, that a root-crop has been consumed upon the land.

Upon the *lightest* class of barley-soils there is great danger of the manure being washed through the soil; on such lands, therefore, the use of the plow is avoided at this time, as the inversion of the soil would favor the loss of manure, and the aid of a cultivator suffices to loosen the soil for the seed-bed. Other soils are brought into a sufficiently loose and free condition for sowing, by means of a single plowing, but by far the larger breadth of our barley-soils requires further preparation. Soils which have only a moderately adhesive character become considerably hardened by the treading of sheep in feeding-off roots, and the hardness is often much increased by the drying action of the sun and air at the latter end of the season. As soon as the ground is clear of sheep it should be plowed up, and if in any way disposed to bake it should be either rolled or harrowed immediately afterwards, as the nature of the soil may render most desirable: it should remain in this state until the time for sowing approaches, and then be plowed a second time. If this does not bring the soil into a sufficiently free working condition the use of the roller and drag will be required. If the second plowing is preceded by the use of the drag, it will materially favor the work, and this should certainly be done if the soil promises to give trouble, for, in this way, we shall find after the succeeding plowing that the bottom portion of the surface-soil will have lost much of its firmness.

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* That is to say, within four or five inches of the surface. According to my experience any loosening of the subsoil by double plowing on light land, in a dry climate, is prejudicial to the barley crop.—F. H. F.

In this or some similar manner the soil must be reduced to a free working condition ready for the seed, for it is the worst of policy to sow barley upon a badly-worked soil. In the busy time of spring sowing a farmer is tempted to sow barley quickly and dispense with extra tillage, when the soil appears to be in fair condition; but I have often seen that it is unwise to lessen the tillage by being in too much of a hurry, as the superior condition given by a second plowing and additional tillage makes a very material difference in the crop. The time thus lost in the sowing of the land is soon regained by the more rapid growth of the young plant, which is often observed to maintain the vigor of its early and prosperous career unabated up to the time of harvest.

When a strong loamy soil has to be prepared for barley, especially after it has been hardened by the treading of sheep, we are often obliged to modify our course so as to secure (if possible) the assistance of frost. With this object the land is plowed up as early as may be after the sheep are removed, and is laid up so as to catch the frost. If the soil gets thoroughly frozen, the after-working of the land becomes comparatively easy, provided reasonable care is taken in selecting the proper time for cross plowing and working the land for the seed. The most laborious and difficult preparation for barley is when land of this description is plowed up in a close condition, so as to be smeared by the mould-board, and, instead of getting any frost upon it afterwards, becomes hardened by exposure. It then requires a vast amount of labor in the shape of rolling, dragging, and plowing, before it can be reduced to a fair state for sowing, and after all does not afford a satisfactory seed-bed for the barley.

I do not know any kind of corn which suffers so much in its quality as barley, from being sown in an unfavorable seed-bed; this is, however, much more evident upon land of a strong and adhesive nature than elsewhere, probably because its mechanical condition is less under our control. The benefit derived from the action of frost enables us to grow, on such soils, barley of fair malting quality; but, if we do not plow in time for the frosts to act upon the land, the produce is rarely fit for the maltster, and can be only employed for feeding purposes.

The best qualities of barley, as well as the largest crops, are produced from soils very free and open in their character, and these indicate the condition to which we should endeavor to bring any soil upon which this crop is to be sown. To promote the same freedom in the soil, the seed should always be sown when the land is dry; for as we have seen in the preparation for wheat, that a wet seed-time was conducive to that increased firmness of the soil which was then our object, so now, when we wish to avoid this effect upon the land, we should in every way avoid the cause

The use of the drill is very generally preferred for sowing barley to every other mode; and for early sowings on light soil is particularly desirable, because it gives an opportunity for hoeing the ground before the clover-seeds are sown. Upon the stronger description of land a very large proportion is sown broadcast, because thus there is less compression of the soil, and a larger breadth can be quickly sown, just when the land is in the best condition to receive it. The usual quantity of seed sown is from 2½ to 3 bushels per acre, but upon soils of inferior quality as much as 4 bushels per acre are sometimes used. For late sowings the quantity is increased, because the plants have less time to establish themselves, so as to produce a sufficient plant.

The difference of seasons has a greater influence upon barley than upon any of our corn-crops; for sometimes the early-sown crops are the best, and at other times the last sowing excels all the others. This generally arises from the alterations produced in the mechanical condition of the land. If, for instance, a piece of land has been well prepared for barley and brought to that degree of fineness which is so desirable for it, and after the sowing a long continuance of wet weather sets in, it is more than probable that the soil will run together and form a crust, alike unfavorable to the germination of the seed and the subsequent growth of the plant. On another piece of land of a similar character sown perhaps a month later, but not thus prejudiced by the weather, the seed grows freely, the plant continues to flourish up to the time of the harvest, and produces a decidedly better crop. If this were a constant result the difficulty would easily be overcome by a later sowing, but next season possibly the circumstances may be reversed; dry weather may favor the rapid growth of the early sowings and delay the germination and general development of the late-sown barley. The time of sowing may be stated as including the month of April; in some cases commencing a little earlier, and in others being prolonged beyond that period.

The depth for sowing the seed is not subject to the same variations as in the case of wheat; one inch may be considered sufficient in all soils to secure its healthy germination. The condition in which the land is to be left after the sowing in some measure depends upon the time of performing that operation. When the barley is put in early, the land may be well harrowed and left without rolling; but as the later sowings are generally accompanied by the clover-seed, these are harrowed and rolled to a fine surface. The object in leaving the one unrolled is to prevent the surface from running together after rain. In the latter case there is less risk on this account, as most of the stormy rains of April are by this time passed, and the more genial weather of May gives less cause for anxiety.

*Oats.*—This grain is usually sown either after roots or else upon a fresh-broken turf of grass or clover-ley. The natural energy of the root of the oat is much greater than that of barley, so that this plant rather resembles wheat in its powers of penetration. This circumstance has a great influence upon the preparation which is desirable; when oats are to be sown after roots, the ground is usually plowed once, and time given to the surface to become mellow under the action of frost, before sowing. There is scarcely any difference between preparing grass or ley for oats, the chief modification being earlier plowing in proportion to the toughness of the turf. An old turf, which must necessarily have got very tough, should be broken up not later than December; whilst a two or three year old clover-ley would not require to be plowed so early. It must be admitted that early plowing of the turf is in no way objectionable, and in many respects advantageous, as the vegetable matter becomes rotted by the action of the weather.

In plowing turf up for oats the skim-coulter should be used, so as to favor the entire covering of the grass; and it is often found that the land-presser is also of service for the more complete laying of the turf, so that the furrow may have a solid bearing with no hollow spaces beneath it. After the turf has been turned over and fairly established, either with or without the aid of the land-presser, the ground may be left until the seed-time comes. During this interval frosts are almost certain to have crumbled the surface and produced a nice light mould for the seed; such land will then present the most desirable seed-bed for oats—a soil well charged with vegetable matter, firm beneath, yet easy of penetration for the rooting of the plant, with a surface light and free in its character for the germination of the seed. This firmness of land for the root must be distinguished from the hardness with which wheat will contend after it has once made a fair growth.

I have known instances in which portions of fields have been so fearfully trodden during the winter (by no means an unusual circumstance in hunting-districts when a large number are in at the death), that all vestige of the wheat-plant has been destroyed, and yet at the following harvest the crop on such portions has been very superior. This the oat could not stand against, for, whilst it requires a firm soil, it cannot flourish in a hard soil. Nothing suits the oat better than a turf plowed down; and, conversely, as a general rule there is nothing preferable to the oat for strong turf. In the north of England where the turf even of a clover ley becomes too rank for wheat, the oat comes in as the substitute; and cases are very rare in which either wheat or barley can displace the oat from old and rich turf newly plowed up. I do not here include clover-leys and such artificial grass-turf, but I think, with these exceptions, there is no corn-crop which will penetrate and break up an old turf as well as the oat; the reason is because turf presents just that condition of soil which meets the requirements of its roots, and, if the seed requires a light covering, this is generally produced by an exposure of the soil to frost and a light tillage of the land. To favor this result the turf should be plowed whilst moderately moist, but the surface should not be broken down for sowing until it is in dry working order; the same degree of moisture which favors the solidity of the turf, would, if the surface be cultivated at the same time, render it close and adhesive, and quite unfavorable to the germination of the seed.

The sowing of oats commences in February, and in some of the midland districts as early as January, but the great bulk is sown in March. There is a very general feeling in favor of early sowing, and the practice is certainly altering in that direction. When oats are sown upon turf, it becomes much more necessary to sow early, than when they follow a root-crop or bastard fallow. The great objection is the influence of frost, which frequently gives a bluish tint to the blade, but, if the land is in fair condition, will not materially injure the crop. A larger proportion of oats than of any other grain is sown broadcast, chiefly because an earlier seed-time can thus be secured. It often happens that the ground will harrow well when it is not dry enough for drilling; and in wet districts, with the uncertainty of spring weather, waiting for the drill frequently involves a considerable loss of time, and thus much is sown broadcast even where the drill would in some respects be preferable.

Upon land which is foul, and especially on old grass-land, it is very important to drill the seed, as we thus secure an opportunity for destroying the weeds, which would otherwise materially injure the crop. After the seed is sown, the land should be well harrowed so as to cover the seed thoroughly. The use of the roller depends much on circumstances; if the ground has been plowed late and is not in a favorable condition, the roller will be employed to reduce it to a fine tilth, but this will precede the sowing. As a general rule (and especially in the case of early sowings), the ground is better not rolled down smooth after the seed is deposited, but should be left rough from the harrow. This roughness will be attended with a double advantage; for it will protect the plant from the severity of the cold winds, and, by the time these are past and the oats are ready for rolling, these rough portions of the soil will be nicely mellowed, so that the crop will then be improved by the fresh soil as well as by the pressure. Upon some of our blowing sands this roughness of the surface is the chief protection to the crop. I have known the greater portion of a crop of oats blown off the ground, simply from the field having been rolled instead of being left rough from the harrow. Upon such land the seed must always be buried deeply, say two inches, for this gives the plant a better opportunity for securing itself to the spot.

The quantity of seed will vary according to local requirements, but the variable character of the seed-oat in a great measure explains the difference in the quantity sown. As the oat degenerates in character, so it becomes longer and less plump than good seed; for this reason, inferior seed weighs less, and numbers less to the bushel, than a sample of close and sound seed. Thus, whilst some use from ten pecks to three bushels, according to the time of sowing, others put on from four to five bushels of seed-oats to the acre. This difference cannot, however, be entirely traced to one cause; for when the climate is wet, and there is a great tendency to produce straw, a thick seeding favors the yield of corn.

*Peas.*—The cultivation of peas is seldom practiced as part of any regular rotation of crops, and they must rather be considered as a catch crop. The preparation will necessarily vary in detail according to the preceding crop. A corn-stubble is more generally selected for this purpose, but a young clover-ley, on which the plant has partially failed, is by no means unfrequently used. The system of cultivation generally approved commences with cleaning the surface of the land in the autumn of the year, after which the farm-yard manure (if any is to be applied) is spread upon the land and plowed in before winter. In this state it remains until the arrival of the seed-time in the spring. If the land during this interval has become close and adhesive, it receives another plowing in the spring, immediately before the sowing of the seed; but this only becomes necessary in the stronger class of soils, upon which peas are not so frequently grown. The pea requires a free and loose soil for its successful growth, and it is upon soils of this character that it is chiefly cultivated. The land can scarcely be rendered too free for their growth, and hence soils which do not need to be plowed a second time are improved by the use of the cultivator in the spring, unless the manure is thus brought to the surface, in which case a drag will be preferable. The seed-bed best suited for peas may therefore be described as a deeply-worked and well-cultivated soil, fine in texture, loose and free; the seed should therefore be sown when it is dry, so as not to prejudice the condition of the land.

The depth at which the seed should be sown will vary from two to three inches, according to the time of sowing and the nature of the land; the earliest sowings and the lightest lands having the seed deposited at the greater depth. Drilling is, beyond question, the best mode of depositing the seed so as to allow of cultivation between the rows during growth. The plan of double rows, nine or ten inches apart, with an interval of 18 or 20 inches between them, is advisable because of the greater facility for cleaning the land and the greater support which the peas gain from the neighboring row. Three bushels of seed to the acre is the usual quantity sown. The early sowings may be commenced in February upon dry and light soils, and be continued up to the middle or end of March, by which time the seed should all be in the ground.

*Beans.*—This crop requires a soil of strong and adhesive character, as much for the supplies of food which it requires, as for the mechanical qualities which such land offers to the plant. In this last respect, beans do not differ materially from wheat; for a firm condition of the land appears in each case to be equally necessary, and our preparation for this crop is regulated accordingly. Beans are almost always sown upon a corn-stubble, and even in exceptional cases the treatment adopted is directed to the attainment of the same condition of soil. The practice of different districts necessarily varies much in detail, but the following system is that which is generally adopted, and may be taken as illustrative of the most suitable kind of management. The stubble should be cleaned in the autumn as well as circumstances will allow; the manure should then be spread upon the land, and the land plowed up deeply and laid as rough as possible for the winter: in this state it lies until the seed-time has arrived. But some prefer to reserve the manure until it can be applied in a well-rotted state early in the spring, and then plow it in; but this does not suit the crop as well as the earlier use already described, especially on true bean-land. If the dung is plowed in before winter, the land has time to become sufficiently settled before the time for sowing, whilst the manure below prevents it from becoming too consolidated for the plant to make a vigorous growth.

The bean flourishes best in a deep but strong soil, and the penetrating powers of its root are well adapted for extending into and through a firm soil; hence the great importance of the cultivated soil being well settled before the seed is deposited. This is secured by the early plowing of the land, whilst the exposure of the surface makes it free and easily worked, and secures a light covering for the seed, open to the influences of air and heat. When the land is not prepared before winter, we often find the seed plowed in without the furrow-slice being broken. Four bushels is an average allowance of seed for the drill, and the beans are thus deposited about three inches from the surface.

The practice of dibbling the seed is quite as general as the employment of the drill, and it has many advantages: one of these (besides the saving of seed) is the earlier sowing which it enables us to make upon the strong land plowed up before winter; for such ground will often admit of hand-labor of this kind when it would suffer much from the working of a drill. Beans are dibbled and drilled at various widths from 9 to 27 inches, but I prefer double rows at the distance of 6 or 8 inches, with 20 or 24 inch intervals. This width between the rows is especially important if we consider the bean crop (as we ought) to be a fallow-crop. When the seed is sown, nothing more is required but to cover the seed, either by hand or by harrow; but after the beans are well above the ground the roller is serviceable, as it consolidates the soil and prepares the bean for an early commencement of the blossoming. This may be advantageously followed by the use of the horse-hoe and stirrers in the intervals, when the beans have sufficiently firm hold upon the land which is immediately beneath them. The time of sowing beans extends throughout February and March, but, as far as climate will allow, an early preparation, followed by an early sowing, will produce the most satisfactory results.

In the growth of winter beans the same objects should be aimed at. The plowing of the land should be finished by the middle of September, and a month allowed for the ground to settle. The seed should be drilled as near the middle of October as possible, after due care has been taken to get the ground firm. It is want of firmness in the soil, and late sowing of winter-beans, that have prejudiced the minds of many against their more extended growth. A firm seed-bed is as important for the stability of the bean as we have seen it to be for the wheat crop, but this point is frequently overlooked. In sowing this variety of bean, the wider intervals are eventually necessary for the purpose of horse-hoeing.

*Grass and Clover Seeds.*—Under this head we may include both natural and artificial grasses. These seeds are small in size, and proportionately weak in their powers of growth; for which reason they require the greater care to secure their healthy germination. A depth and condition of soil which may be suitable for larger and more vigorous seeds is really destructive to their growth. Some experiments which have been reported* on the germination of seeds are so satisfactory and conclusive that I have introduced them here, as they furnish us with decided evidence respecting the growth of seeds under highly favorable circumstances.

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* Morton's Encyclopedia of Agriculture, vol. i. p. 999.

Column No. 1 shows the depths at which the largest number of seeds grew.
Column No. 2 shows the depths at which one-half of the seeds grew.
Column No. 3 shows the least depth at which none grew.

| Botanical Names. | Trivial Names | No. 1. | No. 2. | No.3. |
|---|---|---|---|---|
| | | *Inch.* | *Inch.* | *Inch.* |
| Agrostis stolonifera | Fiorin-grass | 0 to ¼ | ½ to ¾ | 1 |
| Aira cæspitosa | Hair grass | 0 to ½ | ¾ to 1 | 2¼ |
| Alopecurus pratensis | Meadow foxtail grass | 0 to ½ | 1 to 1¼ | 2¼ |
| Anthoxanthum odoratum | Sweet-scented vernal-grass | 0 to ½ | 1 to 1¼ | 2 |
| Arrhenatherum avenaceum | Common oatlike grass | ½ to ¾ | 1½ to 1¾ | 4 |
| Brachypodium sylvaticum | Wood fescue grass | 0 to ¼ | ½ to ¾ | 2 |
| Dactylis glomerata | Cocksfoot grass | 0 to ¼ | ¾ to 1 | 2¼ |
| Elymus arenarius | Sea sand lyme grass | 1 to 1½ | 2 to 2½ | 5 |
| Festuca duriuscula | Hard fescue grass | 0 to ¼ | ¾ to 1 | 2¼ |
| " elatior | Tall meadow grass | 0 to ¼ | 1 to 1¼ | 2¾ |
| " elatior, gigantea | Gigantic meadow-fescue | 0 to ¼ | 1¼ to 1½ | 3 |
| " heterophylla | Various-leaved hard-fescue | 0 to ¼ | 1 to 1¼ | 2¼ |
| " ovina | Sheep's fescue | 0 to ¼ | ¾ to 1 | 2 |
| " pratensis | Meadow fescue | 0 to ½ | ¾ to 1 | 2½ |
| Glyceria aquatica | Reedy sweet water grass | ¼ to ½ | ¾ to 1 | 2¼ |
| Holcus lanatus | Soft meadow grass | ¼ to ½ | ¾ to 1 | 2½ |
| Lolium italicum | Italian rye grass | 0 to ¼ | 1 to 1¼ | 3¼ |
| " perenne | Perennial rye grass | ¼ to ½ | 1½ to 1¾ | 3½ |
| Phleum pratense | Meadow cat's tail | 0 to ¼ | ¾ to 1 | 2 |
| Poa nemoralis, sempervirens | Evergreen wood meadow-grass | 0 to ¼ | ¼ to ½ | 1 |
| " trivialis | Rough stalked meadow grass | 0 to ¼ | ½ to ¾ | 1½ |
| Psamma arundinacea | Sand reed | ½ to 1 | 1½ to 1¾ | 4 |
| Achillea millefolium | Yarrow | ¼ to ½ | ½ to ¾ | 1½ |
| Lotus corniculatus | Bird's foot trefoil | 0 to ¼ | ¼ to ½ | 1½ |
| Medicago lupulina | Black medic or nonsuch | 0 to ¼ | ¾ to 1 | 1½ |
| Ornobrychio sativa | Saintfoin | ¾ to 1 | 2 to 2¼ | 4¼ |
| Plantago lanceolata | Rib grass | ¼ to ½ | 1¼ to 1½ | 2½ |
| Poterium sanguisorba | Common salad burnet | ½ to ¾ | 1½ to 1¾ | 4 |
| Trifolium filiforme | Trefoil | 0 to ¼ | ¼ to ½ | 1¼ |
| " hybridum | Alsike clover | 0 to ¼ | ½ to ¾ | 1¼ |
| " pratense | Common red clover | 0 to ½ | 1¼ to 1½ | 2 |
| " pratense perenne | Cow grass | 0 to ½ | 1¼ to 1½ | 2 |
| " repens | White clover | 0 to ¼ | ½ to ¾ | 1½ |

The inference which may be fairly drawn from these results is, that seeds of this class should be laid as near the surface as possible, so that the covering of the soil shall be of the thinnest character. A slight covering, however, is desirable for the purpose of retaining moisture; for seed placed upon the surface is naturally subject to the drying influence of the air, which, after germination has commenced, may so check the growth as to prove destructive to its existence. In field-culture we cannot rely upon the germination of seeds which are uncovered, because we cannot regulate the supply of moisture; still we see that the depth of the covering has an important influence on the thickness of the plant, and must shape our proceedings accordingly. This explains the variations in the success attendant upon different modes of preparing for grass-seeds.

As these seeds are usually sown with a corn crop, the early preparation of the ground is carried on without regard to their special requirements. They are sometimes sown immediately after the corn is in the ground and the land has been well harrowed; but, unless in the case of a late sowing, this plan is objectionable, because they then sprout and show their tender leaves above the ground too soon, being exposed to injury by the cold nights at the end of April and beginning of May; also because the ground is then in too loose a condition to secure the seed from sinking too deeply into the soil. If the soil has been worked to a very fine condition and is then rolled, the seed may be sown without much loss, a cross-rolling being sufficient to cover it when sown. This extra rolling, however, in case of much rain, might be very prejudicial to the growth of the seed-corn. As a general rule, it will be far better for the grass-seeds to be sown after the corn is well rooted in the ground; the soil will then become settled, and there will be less disposition to allow these small seeds to sink between the particles of the soil beyond the proper depth. The benefit of a slight covering in a great measure explains the greater thickness of the clover-plant when sown upon barley-land which has received *extra* tillage, and has thus been brought to a fine tilth, for the seed thus sown is well placed for immediate growth.

If the surface is at all crusted over, a very light harrowing should first be given; after this the seed may be sown and then rolled down. Should the surface be free and slightly rough, so as to crumble readily beneath the pressure of the foot, the seed may be sown without previous working and then rolled in: but in case the surface is judged to be too rough for this treatment, it must be rolled lightly, harrowed if necessary, and again rolled after the seeds are sown. A careful use of the roller is generally the best means for covering the seeds, but it must always be done whilst the ground is dry and works freely. Another great advantage gained by sowing after the corn is up, is the shelter and protection given to the seeds and also to the young plants. A moderate degree of firmness in the soil beneath the seed is not objectionable, as the roots are powerful in piercing the soil, and a sufficient degree of freedom is usually possessed by land sown with spring-corn.

*Turnips and Swedes.*—Various as is the practice of different districts in preparing land for these crops, still all agree as to the condition of soil to be attained. These crops flourish on deep and free soils, and especially the turnip, which is far less calculated for strong land than the swede. Upon soils which are naturally strong and adhesive, by good cultivation and manure luxuriant crops are grown; but the great point still to be secured is that fineness and looseness in the condition of the soil which enables the roots of the plants to gather nourishment and make their growth. By plowing the stronger class of soils before winter, and by active tillage in the spring of the year, these necessary conditions are secured, and thus the tenacious and adhesive qualities of many soils are for a time, at least, changed, and deep tilth is secured, well adapted for the extension of the roots in search of food and moisture. The lighter class of soils are brought into a proper mechanical condition with much less difficulty, so that, instead of the preparation having to be commenced before winter, it is often found desirable to grow a crop of spring-feed upon the land, in the expectation that after it has been consumed, one or two plowings will prove sufficient to prepare for the turnip-crop. It is by no means uncommon for the land to be prepared as if for being sown, fourteen or eighteen days in advance. The land in such cases is harrowed down fine and left in this condition, so that the seeds of any weeds may make a growth, which will be destroyed when the surface is moved in the sowing of the turnip-seed.

Respecting the cleanness of the land and its friable condition as a preparation for these crops, there will be scarcely any difference of opinion; but as regards the moisture of the land there will be considerable diversity observable: whilst some cultivators endeavor to get their soils as dry as possible, others regulate their proceedings so as best to preserve the moisture in the soil. Thus, in the practice just mentioned of working the land fine and leaving it undisturbed for a time, so that the seeds of weeds may sprout, some would plow the land up and let it dry for the reception of the seed, whilst others will be equally particular not to move it farther than by harrowing the surface, for fear of drying it.

It is not only in this particular instance that there is such contradictory practice, but it pervades all the preparation immediately preceding the sowing of the seed. I have had a fair share of experience in the growth of turnips and swedes, and have always found the dry seed-bed to be decidedly preferable. The cause is not difficult of explanation. When seed is deposited in a soil which has been properly cultivated, and there is a moderate degree of moisture, it speedily germinates. The hot weather which we are accustomed to have at this time causes a rapid growth, and the young plant quickly appears above the surface; but the warmth which has thus far been productive of apparently good results has probably by this time robbed the soil of so much of its moisture that the supplies to the plant decrease at the most critical time of its existence, and unless rain falls the crop is lost; or if the turnip-beetle should commence an attack there is but little hope of the plant gaining the mastery. The case is very different when the seed is deposited in a dry soil: there it lies uninjured, waiting for rain, and does not begin to germinate until it gets it. The rains in June generally afford a tolerably liberal allowance of water when they do come, quite sufficient to carry the seed well through its first stages of growth, until it has a rough leaf and a strong root. The delay is immaterial as regards time, but not so as regards the safety of the crop. If the seed does germinate during those intervals of dry weather, *its existence is really dependent upon a timely supply of rain;* but so long as growth has not commenced no fear need be entertained for the crop. Dryness at the time of sowing becomes of greater importance as the land gets lighter in its nature and more easily dried by the heat of the sun.

The quantity of seed sown to the acre varies from 2 to 6 lbs., according to circumstances. One very frequent cause of failure is mixed seed, of which only a portion will grow. This is easily detected by growing a given number of seeds in a pan. When the seed is of good quality, an allowance of 4 lbs. per acre is ample, but not excessive; indeed, I consider that the risks which the plant runs in its early days render a decrease in the quantity of seed very poor economy, and this becomes evident when we consider how large an outlay is dependent upon the safety of the plant. A liberal supply of good seed gives a far better chance for some to escape the turnip-beetle, because, unless it is a very wet season, it is more than probable that the seed will not all germinate at one time, and for this reason patience often does as much good as a second sowing of seed.

The drill is the best implement for turnip-sowing, and if artificial manure is applied at the same time, as is very desirable, the arrangement of our best drills for getting a layer of earth between the seed and manure is very important.

The ravages of the turnip-beetle render dibbling quite unsafe. The seed grows most satisfactorily when deposited about half or three-quarters of an inch beneath the surface: this is shallow enough for a safe growth without causing any unnecessary delay. After the seed has been sown, harrowing once is sufficient to leave the land in proper order, but rolling should in general be avoided. There is a greater variety of opinion as to the time of sowing swedes than any other root-crop. Early sowing, which is favorable—I might say, essential—for some districts, is altogether unsuited to others. Thus, from early in May to the middle of July, swedes are being sown according to local opinions. The principal cause of this is the mildew, which the swedes suffer from if their growth experiences a sudden check; but, whilst local peculiarities do exist and exert their influence upon the time of sowing, yet I am bound to say that as the system of cultivation is improved and the land is more thoroughly worked, the sowings may be made at an earlier date with far greater safety.

*Mangold-Wurzel.*—This root is better adapted for strong soils than the swede, and possesses greater powers of growth through a retentive soil than any of our root-crops. The looseness and friability of soil, which were necessary for the turnip and swede, are not necessary in this case except in a very reduced degree, and for this reason a course of preparation answers very well for the mangold which would not do for any other root. There are two modes of preparing for this crop. The one is a complete autumn preparation, so that the dung is plowed in and the land ridged-up for the seed before winter, whilst the other leaves the application of the manure and the tillage of the land to be finished in the spring. Each of these plans has its respective advantages.

The autumn preparation influences the mechanical condition of the land by exposing the surface of the land to the winter frosts, whereby it is crumbled into a fine and loose seed-bed, whilst the manure beneath prevents the soil from becoming too consolidated, with the additional advantage that you are ready to sow in good time, and can insure that the land shall be in good condition for the seed even when other ground cannot be touched. The surface-soil, which the winter has brought into such good order, generally retains its character, unless it is worked by some implement which smears and glazes the surface, but this must be carefully avoided. This autumn preparation is easily completed in unfavorable seasons by dibbling the seed by hand. If the spring weather is unpropitious, there is great difficulty in then completing the necessary preparations for sowing in good season, and especially in securing a nice fine covering for the seed, which is not the less essential, because at a later stage the roots luxuriate in a strong soil, such as cannot always be brought to a fine tilth by spring culture. On such soils this is often a great difficulty.

Early sowing is of great importance for this crop. The usual season is from the middle of April to the middle of May, and for the heavy crops we must not trust to late sowings. The growth of the seed may be promoted by steeping it in water for a few hours before it is planted. This will soften the skin and render germination more rapid. After this has been done, it should be kept moist until it be placed in the soil, and then be lightly covered by fine soil to the depth of from half to three-quarters of an inch. It is usual to run a light roller over the surface after the seed is sown, unless the soil is too moist to allow it to be done. The best mode of sowing the seed is by means of the hand-dibble, especially in the case of strong land, upon which it often enables an early sowing to be secured, when waiting for the drill would have made it late.

*Carrots and Parsnips.*—A deeply-cultivated soil is necessary for each of these roots, but they differ in the soils for which they are best adapted. The carrot flourishes best in a very loose and friable soil: the parsnip prefers stronger land, and can be successfully grown on soils which are too stiff for carrots. The best mode of cultivating them is after another root-crop, as they require the land to be kept very free from weeds during their growth. When they follow a corn-crop particular care must be taken to have the land well cleaned in the autumn, and plowed (if possible subsoiled also) before the winter. Thus the labor in the spring will be brought within moderate limits for securing that condition of soil which these crops require, viz., a deep and thoroughly-cultivated soil, with a fine surface; when this has been obtained we may consider that we have completed the necessary preparation.

Carrots should be sown early in April, and the parsnips early in March; for producing heavy crops the seeds must be sown in good time. The progress of the parsnip and carrot may be much favored by mixing the seed with some damp sand a few days before it is to be sown, and laying it out shallow in a warm room. When this is not done, the carrot-seeds need other preparation, because they cling together so much; a good rubbing between the hands, followed by the admixture of as much as three bushels of ashes to the acre, is probably the best means for favoring its distribution on the land. When this precaution is taken, the seed can be very easily drilled, and this is by far the more frequent mode of sowing both these crops; but many prefer sowing both carrots and parsnips by hand, especially after germination has been encouraged. It is a very good plan to mix some corn with the seed, so as to indicate its position for the early guidance of the horse-hoe.

The seed is usually sown in drills, from 12 to 18 inches apart; and about 6 lbs. of seed per acre gives a sufficiently thick plant. It should not be buried more than three-quarters of an inch from the surface. When the sowing is completed, the land should be lightly harrowed, if corn has been mixed with the seed, but otherwise it will be better to roll the ground, so as not to destroy the drill-marks; but, if the land be at all adhesive, a light harrowing is preferable.

*Rape or Cole.*—The general requirements of this crop are similar to those of the turnip, and need not be repeated; but I may add to former remarks that the peculiar characteristics of some of our soils which are favorable for growth of rape, but not of turnips, arise from their composition rather than from their mechanical condition. The preparation necessary in each case is the same; but the time of sowing extends from April to September, according to the succession of food which may be required. The rapidity of growth varies much with the climate, richness of the land, and method of cultivation; but the sowings in April and May will generally be ready for feeding in August and sometimes in July, whilst the August and September sowings come in for spring use. As the principal demand for rape is in September and October, the corresponding seed-time is June and July; still the influence of climate will often render the growth slower, and necessitate an earlier sowing. From 2 to 4 quarts of seed per acre will be necessary, according to the suitability of the soil and climate, care being always taken to increase the allowance of seed as circumstances become unfavorable.

*Spring-feed.*—The crops which are usually sown for this purpose (with one exception, which I shall subsequently notice) all require a similar preparation to be given to the land for the reception of the seed, however varied may be the soils for which they are in a special degree adapted, and however this character of the soil and the succession of food required may influence the choice of the crop. They are sown upon the corn-stubble, and the class of soils selected for their growth are generally dry and free in their nature. Their growth upon strong soils is exceptional, and never to be recommended except in dry climates. After the corn is cut the cleaning of the surface should immediately commence, and, as soon as this is done, the land should be deeply plowed (for we have to prepare for the succeeding root-crop as well as for the present one); after it has lain a few days the sowing of the earliest spring-feed may take place. Nothing further, besides rolling, will be required before the seed is sown, for these soils are not difficult of cultivation. Rye is one of the earliest crops for spring-food, and usually forms the first sowing. It is generally sown broadcast, at the rate of 4 bushels to the acre. The next sowing will be rye and vetches, or else winter-oats and vetches mixed. For these the same preparation will be necessary. The usual allowance is 1 bushel of rye or oats and 3 bushels of vetches per acre, either sown broadcast or by the drill: thick sowing is always advisable for spring-crops. For these crops rather stronger land may be selected than for the rye, and they are also more likely to receive manure, as they require more nourishment from the land, and, if so, the roller will be necessary.

The sowings will be commenced in September, and continued at intervals to the end of October. Vetches may be sown about the middle of October, without any mixture; but they will not be ready for use as quickly as the mixed seeds. In these cases rolling will be found advisable, especially when the soil is not covered with a fine mould, which is very necessary for the growth of these seeds. It is also desirable, after the use of the drag, to give some pressure to the soil, as they do not thrive well when the ground is too loose; with rye this is not so material as with vetches. A dry time should be selected for sowing the seed, and after this the land should be left harrowed and not rolled.

*French Clover or Trifolium.*—This plant is somewhat peculiar from the excessive firmness of soil required for its successful growth. It is usually sown after a corn-crop, and, for its culture, a clean stubble should be selected upon land which is tolerably stiff. If this is twice harrowed it will produce soil enough to cover the seed, and this seems to be all that is requisite except a light rolling. This may appear to be a slovenly mode of farming; but it is decidedly the best plan, for, when the stubble is pared and the land cleaned, and especially if it should be plowed, the trifolium will not thrive so well. As regards the appearance of the stubble, provided a clean stubble be chosen, no doubt need be entertained that successful practice will justify from every charge of neglect, when in the spring the stubble disappears amidst the luxuriant growth of the clover. About 20 lbs. sown broadcast will be found a sufficient quantity of seed to the acre. When the soil has been loosened more than by moderate harrowing, the roller must precede the sowing, otherwise much of it will run down into the soil too deeply for germination, and a thin plant will be the consequence.

I have thus noticed the special requirements of each of our principal agricultural crops, so far as regards the mechanical condition of the land, and other circumstances connected with the successful germination of seed. So far as my limits have allowed me, I have endeavored to show the chief variations in practice; but it must be remarked that local peculiarities of soil and climate will occasion exceptions from these general rules in minor points of management, which are still of the greatest importance for obtaining a successful growth. I do not, therefore, pretend to say that the conditions named will be *invariably* applicable; but, from a rather extended experience, I have reason to consider that they represent the most successful systems of management.

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[*Journal of the Royal Agricultural Society of England.*

# THE PROPER OFFICE OF STRAW ON A FARM.

BY HENRY EVERSHED.

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## PRIZE ESSAY.

[From the Journal of the Royal Agricultural Society of England.]

Straw is used on most farms, both as food for stock, and as a bed for them to lie on; I shall therefore endeavor to assign to each of these uses its proper value. The requirements of the farm-yard necessitate, as I believe, certain modifications in the use of straw; and the system of letting the cattle "eat their liking" from the crib, and tread the rest under foot, though still finding favor in some secluded districts, may be amended.

The present high price and growing demand for meat will make us all look inquiringly at our straw-stacks, anxious to know whether all their value departed with the grain, or whether there be not beef or mutton latent in straw as well as in turnips.

It is a common remark on many of the best managed and most profitable farms, "How shall I manage to tread all this straw into good dung?" And on other farms differently situated, "How shall I get straw for all this stock?"

It is, however, a mistake in any case to be too anxious to "tread in" straw. Straw is not dung; it is, as litter, a medium for soaking up the liquids and solids of a farm yard, making a dry bed for cattle. Taking its market value at 1*l.* per ton (in some neigborhoods it is twice as much), fifty tons will buy 50*l.* worth of guano, worth on any farm more than fifty tons of straw merely "trod into dung."*

The using of straw for the sake of getting rid of it, is a miscalculation, and any covenants which necessitate this by withholding permission to sell it, are surely founded in error.

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* The above conclusions are not strictly correct, or at least not applicable in all cases. 1st, although straw be not dung, yet the carbon as well as the minerals which it contains have a positive value as manure, and exert a special influence on light sandy soils. On such soils guano is a very inadequate substitute for farm-yard manure. Moreover, in the case before us, 50 tons of straw must be taken to represent a large number of tons of inferior manure. On farms where a good head of stock is economically fed, it must be quite an exceptional case if there be any superfluity of straw; because, where the land is strong and the climate moist, so that a great bulk of straw per acre will be grown, there will generally be a considerable admixture of pasture with the arable land: when the land is light and the climate dry, and the farm almost exclusively arable, the yield of straw will not be great, and a considerable portion of it will be required as a substitute for hay in feeding the stock. A good farmer does not generally find that he has more straw than he can turn to *good* account, although, under certain circumstances; he may think it *better* economy to sell a portion, and replace it by purchasing manure.—P. H. F.

I shall now turn to a more common state of things, where straw is not in excess of the ordinary requirements of the farm: first examining what appears to be the most important, because the most indispensable, of the uses of straw, viz., as litter. All the larger animals require litter of some sort. A warm, dry, and soft bed is quite indispensable for their comfort. As an expedient for saving straw, I once put twelve three-year-old oxen on boards to fatten, and found it a very cruel experiment. The animals were always in a state of distress; one of them refused to lie down, and remained standing four days, until the muscles of the thigh swelled from the unnatural tension. A comfortable layer of straw soon set all right again, and as the spaces between the boards allowed the moisture to pass into a drain, a great saving of litter was effected.*

A wish to save straw occasionally leads to a sparing use of it in the yards, always resulting, however, in the immediate discomfort of every head of stock. In fact, the best of food, and unremitting attention, will not compensate for the want of a comfortable bed. Frequent supplies of dry litter in sheds and yards are absolutely necessary. Those who are accustomed to a well stocked farm-yard are aware how entirely success depends on attention to details; the omission of any of these mars all. A comfortable bed is one of the most important.

It may be asked, "Is it the proper use of straw, to be spread over the wet surface of a yard, to be soaked by rain, and then covered up by a fresh layer, and finally 'trodden' into indifferent dung?"

This question brings me to the subject of covered yards. The desire to spare straw led to the erection on my own farm, and on another under my direction, of sheds covering a considerable space of yard, besides cattle-boxes. It would be quitting the present subject to expatiate on the various advantages derived from these arrangements; I may observe, however, that one great advantage is the saving in straw which they effect.

With regard to live stock, I have seen them thrive as well in warm, sheltered yards, open to the sun, and well supplied with litter, as in the best appointed stalls, boxes, or covered yards. But the litter is wastefully used, the manure less valuable, and the amount of cartage greater.

The question of rain falling in a year, on a yard 50 ft. by 40 ft., at 25 inches per annum, amounts to 25,967 gallons, weighing nearly 116 tons During heavy rain a large quantity runs off, carrying with it the soluble portions of the manure; but after making due allowance for evaporation, there will remain many tons absorbed by the straw, costing nearly 7*d.* per ton if carted a quarter of a mile.* In covered yards the dung is concentrated; it is never washed; and cartage—that costsy item—is reduced to a minimum.

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* The cocoa-nut matting used by Mr. Horsfall in his cow stalls may be found serviceable by other farmers who, as in his case, are situated in neighborhoods where straw is both dear and scarce. It would not, however, be used to the same advantage for steers as for cows.—P. H. F.

The quantity of straw required to keep open yards in a comfortable state, depends of course on the weather; and also on the kinds of food given to the stock. Turnips and green food increase the secretion of urine, and litter is needed in proportion.

In ordinary years, and in open yards, with sheds, 50 head of stock require, as litter, 300 tons of straw in nine months, from September 1st to June 1st. This reckoning supposes ten horses to be kept in the stable, whose litter is thrown daily into the yards; the rest being cows and fattening cattle. The amount of straw used daily per head is 48 lbs., or twice as much as is required under shelter.

It is stated in an excellent paper on manure, in "Morton's Cyclopedia," that 20 lbs. of straw per day are required to litter an ox, in a box containing 100 square feet. This agrees with the quantity used in my own boxes, in each of which I find, after six months' fatting, 8 tons of dung, 6 tons 8 cwt. of which are derived from the ox, and 1 ton 12 cwt. from the litter.† About 24 lbs. per head are used in the covered yards, which are occasionally treated to a dose from the stabe tank.

Fifty head of beast, fattened in covered yards, will produce in six months—

| | Tons. |
|---|---|
| Voided by the animals | 325 |
| Litter (24 lbs. per head daily) | 100 nearly. |
| | 425 |

425 tons of dung, fit to plow into the ground at once.

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* This cost of 7*d.* per ton is thus estimated:

| | *s.* | *d.* |
|---|---|---|
| 2 men to fill 36 tons | 3 | 8 |
| 5 horses and 4 carts (a trace-horse being employed to drag the load on to the heap) at 2*s.* 6*d.* | 12 | 6 |
| 2 lads to drive | 1 | 8 |
| 1 man at the heap | 3 | 2 |
| | 20 | 0 |

$$\overset{s.}{\frac{20}{36}} = \overset{d.}{\frac{20 \times 12}{3 \times 12}} = \overset{d.}{\frac{20}{3}} = 7d. \text{ nearly.}$$

—H. E.

† Mr. Lawes informs me that he takes from his horse-boxes, of the same size, 6 tons in 6 months. The one statement corroborates the other, or rather Mr. Lawes shows quite as small a decrease as I should have anticipated from the horse being out at work during so many hours. As far as I could ascertain, the supply of straw given to the horse averaged quite as much as 20 lbs per day; and if this be the case, the horse would contribute about two thirds as much as the ox to make up 6 tons.—P. H. F.

The same stock in open yards will produce—

| | Tons. |
|---|---|
| Voided by the animals | 325 |
| Litter (48 lbs. daily) | 200 |
| Water | ? |
| | 525 |

525 tons of mixture, to be carted to a heap and fermented. This is exclusive of a great weight of water.*

In six months' fatting of 50 head of catte, in covered yards, the amount of straw saved is therefore 100 tons; worth, at Mr. Horsfall's estimate, 35s. per ton, to convert into butter and beef!

I conclude this part of the subject by observing, that the proper use of straw as litter is, to provide a comfortable bed, and to absorb the excrements of the stock. These conditions can only be fully secured when the bed on which the animals lie is covered.

### STRAW AS AN ARTICLE OF FOOD.

All cattle will eat a certain quantity of straw if they can get it. The calf, who knows no stint, nevertheless, chews straw in his pen, and the pampered medallist at Baker Street, or Bingley Hall, astonishes wondering citizens by condescending to eat a portion of his bed.

Nor is this an abnormal condition of things. Any one who will visit those beautiful southern counties, celebrated by Cobbett in his "Rural Rides," where picturesque little homesteads are dotted about the country, and the sound of the flail may yet be heard, will find the fatting cattle standing by turns at the barn door, disposing of each choice handful as it is put forth, and when duly satisfied retiring to the shed to chew the cud, showing every sign of content and enjoyment.†

The yards of the smaller farmers, as yet untouched by modern innovation, often display an interesting picture of neatness and economical contrivance. That look of comfort pervades them, which is of the first consequence to the well being of stock, and without which the "Tables of Nutrition will be studied in vain.

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* The exact weight of water left in the dung cannot easily be estimated, as a portion evaporates and some runs off; but if 116 tons per annum fall on a yard 50 feet by 40 feet, and if eight such yards are needed for 50 head of stock, and if the dung be exposed during 6 months of average rain-fall, the 525 tons of dung will be soaked by 464 tons of water —H. E.

† This picture belongs to the poetry of agriculture. No doubt the best-fed beast delights in an occasional look of straw, which doubtless is of great service, directly to digestion, and indirectly to nutrition; but he likes it as the citizen does his plain boiled potato *with his steak*, or the northern tourist his thin oatmeal cake, or single saucerfull of porridge *with cream*. But our author shows plainly, further on, that he does not overrate straw as the mainstay of a dietary, nor does he seem to consider the natural form of straw to be the most available form for the *general* purposes of nutrition. The hint on "comfort" which follows is a word in season.—P. H. F.

The analyses appended to this paper show that straw of various kinds contains rather more of the muscle and flesh producing substances, and considerably more of those which furnish heat and fat, than turnips. A ton of straw contains more food than a ton of roots. But if cattle are fed on the latter alone they will thrive,* and on the former store stock will barely, under any circumstances, retain their condition. This proves nothing as to comparative value, but it proves that the elements of nutrition must not only exist, but they must exist in an available form.

An ox fed on oil-cake alone would shortly die, because the elements of nutrition would not be presented to him in an available form. But it does not follow that oil-cake presented in some other form could not be digested. The same applies to straw; and, indeed, we should be led to conclude, from the fact of an ox requiring so much bulk in his food, that straw might be employed to supply that need.

Straw is a cheap article with which to distend the stomach, and we ought to use it in just such proportions as we find, by experience, it can be profitably used, as a substitute for other and more expensive food. There are two main elements in our calculation: cost of food, and value of beef produced. There is another: value of the manure. But although nitrogenous and other elements are worth something as manure, they are worth more in the shape of meat. Cattle should be fed, therefore, so that as little as possible goes into the manure. In other words, the food should be given in such a form that the animal can appropriate the maximum of its most valuable constituents.

There are few farmers who do not use straw to some extent as a substitute for some portion of the more costly articles of diet. Perhaps its more general use, in this way, is as food for store cattle in combination with roots. If 20 lbs. of straw and 1 cwt. of roots cause an ox to thrive as fast as 2 cwt. of roots, then there will be a gain to the feeder by using the former.

| | | s. | d. |
|---|---|---|---|
| Cost of 2 cwt. of roots at 7s. 6d. per ton................ = | | 0 | 9 |
| Cost of 1 cwt. of roots.............................. = | 4½ | 0 | 6⅝ |
| And 20 lbs. of straw ot 1*l.* per ton = nearly............. | 2⅛ | | |
| Gain.......................................... | | 0 | 2⅜ |

This is a saving of 26½ per cent. nearly.

It is a common plan in grazing districts, where roots are scarce, to feed store cattle on about 20 lbs. of straw and 3 lbs. of bean meal. I have found them do better on straw, with roots instead of meal, even when the supply of roots did not exceed ½ cwt. per head per day. Cattle wintered on straw and meal only become "hide bound" with staring coats.

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* Surely not alone? When was this ever put to the proof? Farmers, talking in a loose way, may have boasted of fatting beasts on turnips alone, but this was most probably effected in well littered yards; so that they spoke *taking no account* of the straw consumed in addition the value of which, as an auxiliary, is sufficiently indicated in the previous page.—P. H. F.

The cheapest, though not probably the most economical, plan of feeding store cattle is to give them whole roots, and to put the straw, uncut, into racks, making them, in fact, cut and prepare their own food. The objection to this plan is the danger of choking an animal by a small root, or a portion of one, sticking in the throat. There is great risk of such an accident when the roots are small and hard. Mangold, being soft and usually larger than turnips and Swedes, may be given with comparative safety. Store animals fed in this way will do well, and perhaps as well as on prepared food, probably in consequence of the more perfect mastication and deglutition of food when taken slowly.

It was one of the advantages of thrashing by flail that the straw came daily from the barn into the racks as it was wanted. Under the present system it will generally be found more convenient to cut a portion of the straw stack into chaff at a leisure time, and store it away for future use. It is quite indispensable to store it in a place free from damp, for unless kept perfectly sweet it will disorder the stock, and will not be eaten with relish.

A cheap and excellent floor for a chaff house is made with asphalte; and unless the site is particularly dry, the interior walls should have a coating of the same material, reaching three or four feet from the ground.

The cost of cutting straw into chaff with a machine driven by horse gear is 6*s.* per ton. And it costs quite as much to cut it by steam power, unless other machinery, covering part of the expense, is driven at the same time. Under the most favorable circumstances a saving of 2*s.* per ton may be effected.*

It has been suggested that steaming straw renders it more wholesome. On trial I find that a large apparatus with two "pans" will steam 250 bushels, weighing 1625 lbs, in a day, at a cost of 7*s.* 6*d.* per ton. This quantity would be sufficient for 90 head of cattle, supposing each to receive 18 lbs. daily. The expense of steaming a smaller quantity is much greater in proportion, as the cost

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* Details of cost of chaff-cutting :—

| | £ | *s.* | *d.* |
|---|---|---|---|
| 1 man to feed | 0 | 2 | 0 |
| 1 man to supply him | 0 | 1 | 8 |
| 2 men to straighten the hay or straw | 0 | 3 | 4 |
| 1 man to remove chaff to chaff-house | 0 | 1 | 8 |
| 1 man to drive horses | 0 | 2 | 0 |
| 2 to bring hay or straw from the stack to machine | 0 | 3 | 4 |
| 1 horse for ditto | 0 | 2 | 0 |
| 3 horses to work by turns, two at a time | 0 | 6 | 0 |
| For use of chaff cutter and horse-gear (10 per cent. on 25*l.* if used once a week) | 0 | 1 | 0 |
| | £1 | 3 | 0 |

If 4 tons are cut in a day the cost is 5*s.* 9*d.* per ton; it would, however, be a long day's work to cut that quantity into short chaff fit for feeding cattle with a 2-horse gear. If allowance be made for short days in winter, when chaff is most in use, and for the interruptions which sometimes occur, 6*s.* per ton is not too high an estimate.—H. E.

of fuel and attendance cannot be reduced in proportion to the smaller quantity of straw steamed.

The expense of this process is very much reduced, when the waste steam of a fixed engine can be employed.

If it cost 6*s* per ton to cut straw into chaff, and an additional 7*s*. 6*d*. per ton to steam it, then it may well be doubted whether the cost of preparation is warranted by the value of the article when prepared.

Straw with its 40 per cent. of woody fibre is, at the best, anything but digestible. And we know of no available method for converting this fibre into food. Steaming does not appear to do much for it except to make it palatable; and I believe, the advantages derived from steaming may be obtained at much less cost, by fermentation with pulped roots.

Fatting cattle can readily be induced to eat from 10 lbs. to 14 lbs. of straw-chaff by mixing it with their cake or corn. Either fatting or store cattle will eat any kind of chaff when mixed and fermented with pulped roots. My cows are at the present time eating 18 lbs. each daily of straw-chaff prepared by this method; and I have found no difficulty in inducing them to eat rape-cake, which otherwise they would not touch, by grinding it small and mixing it into the heap of pulped roots and chaff

With regard to the value of different sorts of straw, any kind saved in good condition is better than any other kind at all damaged. If at all injured, it should be condemned for litter; none but the best should be given to stock. The nearer it approaches to ripeness when cut, the less wholesome and nutritious it is.

Cattle prefer oat-straw, or barley-straw with clover in it, and both are excellent fodder. Pea haulm is eagerly eaten by sheep, and is very serviceable in the racks of horses and store cattle in the winter months. On sheep-farms every handful should be saved for the ewes and store flock.

Bean haulm is frequently exposed too long in the field, but if carted in good condition, it should be carefully saved and cut into chaff. For although cattle and horses will eat it from racks during the winter months, they will waste a portion. On dairy-farms bean-straw is especially useful for the cows, and may be made palatable by fermenting with pulped roots.

It is an interesting fact that well-fed cattle, kept in open yards, will eat more straw during the winter months than other cattle kept under the warm shelter of a roof. The careful manager saves his stock of bean-straw until the cold weather sets in knowing that at that season its bitter flavor will be disregarded.

During the present winter I compared the quantity of mixed hay and straw-chaff eaten by six oxen, fattened in a warm cattle-house, with that consumed by cattle of the same age and breed in an adjoining yard. Each lot was fed alike in respect of corn and roots, and as much chaff was given as they would eat. Those in the house ate 14 lbs., and the others 18 lbs. daily; showing a difference of nearly a fourth less carbonaceous food, required by cattle when kept in a condition of artificial warmth.

This fact indicates the value of straw for maintaining animal warmth. It would require a long course of experiments to ascertain its value as compared with hay and other articles of food. The results of experiments of this kind are frequently unlike. They are affected by the age and breed of the animal, by the kind of food used in connection with the straw, by temperature and other circumstances. When animals are much exposed to cold it may be right to give them a considerable quantity of straw, and but little hay, in their food; but it does not follow that it would be right to give the same quantity and proportions, on removing the cattle to a warm house. We have already seen that when kept warm they require less carbonaceous food.

Straw is not sufficiently digestible and nutritious to be a desirable addition to the food of young animals.

Having thus pointed out the known value of straw as an article of food, I now leave it to the reader to decide whether in his own particular case he cannot profitably convert more of it into meat.

*Composition of Wheat-straw, air-dried.* From Morton's "Cyclopædia."

| | |
|---|---|
| Nitrogenized, or muscle-producing substances | 1·85 |
| Substances free from nitrogen, heat and fat producing substances | 26·34 |
| Insoluble substances | 41 22 |
| Mineral substances | 4·59 |
| Water | 26 00 |
| | 100·00 |

*Barley-straw.* From Morton's "Cyclopædia."

| | |
|---|---|
| Nitrogenized substances | 1·70 |
| Free from nitrogen, soluble and insoluble | 82·12 |
| Mineral | 5·24 |
| Water | 10 94 |
| | 100 00 |

*Oat-straw.* By Boussingault.

| | |
|---|---|
| Nitrogenized | 1·8 |
| Non-nitrogenized, soluble | 22·1 |
| do insoluble | 43 8 |
| Mineral | 3·6 |
| Water | 28 7 |
| | 100·00 |

*Pea-straw.* By Boussingault.

| | |
|---|---|
| Nitrogenized | 12 55 |
| Non-nitrogenized, soluble | 21·93 |
| do insoluble | 47·52 |
| Mineral | 6·00 |
| Water | 12·00 |
| | 100·00 |

*Bean-straw.* By WAY, "Royal Agricultural Society's Journal."

| | |
|---|---|
| Moisture | 14·47 |
| Albuminous matter | 16 38 |
| Oil or fatty matter | 2·23 |
| Woody fibre | 25·84 |
| Starch, gum, &c | 31·63 |
| Mineral | 9.45 |
| | 100·00 |

*Rye-straw.* By BOUSSINGAULT.

| | |
|---|---|
| Nitrogenized | 1·52 |
| Non-nitrogenized, soluble | 37·10 |
| do insoluble | 39·75 |
| Mineral | 2·93 |
| Water | 18·70 |
| | 100 00 |

*Clover-hay.*

| | |
|---|---|
| Nitrogenous | 10·29 |
| Non-nitrogenous | 62 63 |
| Mineral | 6 08 |
| Water | 21·00 |
| | 100·00 |

*White Turnips, Swedes, Mangolds* (by VOELCKER), *and Carrots.*

| | White Turnips. | Swedes. | Carrots. | Mangolds. |
|---|---|---|---|---|
| Nitrogenous | 1·143 | 1·443 | 1·48 | 1·81 |
| Non-nitrogenous | 7·799 | 8·474 | 11 61 | 11·19 |
| Ash | ·628 | ·623 | ·81 | ·96 |
| Water | 90·430 | 89·460 | 86·10 | 86·04 |
| | 100·000 | 100·000 | 100·00 | 100 00 |

*Gosfield, Halsted.*

From the conflicting opinions of scientific men, based on chemical analysis, as to both the feeding and manuring value of straw, and the almost contradictory statements of other writers on this subject,—the large promises of direct profit held out by some from the combination of straw chaff with richer food in cattle feeding, contrasted with the assertions of others that however high may be the true theoretic value of straw for feeding, still it will not answer to buy rich food for the purpose of mixing with straw-chaff,—we turn with satisfaction to the practical good sense of the author of the present Essay.

The highest service which can be at present rendered to agriculture is, perhaps, that of the practical man who, informing his mind, and shaping his observations by the light of scientific speculation, will address himself methodically to put things to the proof under his own eye; testing, measuring, and weighing, not estimating results, yet making due allowance for the influence which disturbing causes exercise on the *average* result as compared with the maximum effect which can be produced at some short and picked moment of time.

In this sense our author seems to be truly practical, and if he leans a little to the old-fashioned side, that is the safe side for him who is not unwilling to test and try well recommended novelties. If his estimates differ from those of other recent writers, they may perhaps be found to square with a sober view of average results, when others are rashly generalizing from exceptional cases.

These pages are fully as valuable for the suggestions they offer as for the conclusions at which they arrive. Our author, indeed, gives us full means of estimating the amount of manure which may be made under a given course of feeding in boxes or in covered yards, in which respect his calculations may be of great service in aiding us to arrive at a standard for the composition and value of farmyard manure,—a standard with which all other qualities of such manure must ultimately be compared and measured. But boxes and covered yards are hitherto the exception and not the rule. When, however, he comes to the point which most materially affects the majority of farmers, how far this problem is modified when the cattle are fed in open yards, or even when the litter is thrown out from stalls into such yards, our author does not venture to clench his statement; he has, however, at my suggestion, appended a note to his original Essay, in which he calculates approximately that the rainfall would add 464 tons of water to the 525 tons of manure on which it is supposed to fall.

This estimate is, however, subject to deductions; first, for overflow from the yards, and, secondly, from the effects of evaporation. It must, however, be borne in mind that the assumed dimensions of the yards are very small, such as are not often found except in connection with modern buildings, where waste from overflow is carefully guarded against. If the buildings were old-fashioned, the area of the yards would probably be much larger, and the drippings from the roof would add considerably to the direct rainfall; these two sources of an increased supply of water would probably compensate for the overflow. Very little is known as to the amount of evaporation arising from a bed of straw, the top of which is comparatively dry; but, as the surface exposed is but small, and the situation sheltered, the loss of moisture from this cause is probably not great, especially during the winter months. Taking Mr. Evershed's calculation as it stands, without abatement, 200 tons of litter would, in open yards, furnish 989, or, in round numbers, 1000 tons of manure. Considering, therefore, that he calculates the amount of rainfall for yards only of such moderate area as seem best adapted to improved modern practice, it may be reckoned that, in the larger old-fashioned yards, the weight of manure to be carted is doubled by the rainfall.*

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* The result will be the same if we allow for the employment of a *smaller* number of yards, and, consequently, fewer head of stock kept for a *longer* period. Four yards filled the whole

This conclusion will be confirmed by regarding the subject from another point of view; that of the quantity of manure commonly reckoned on as ready for use on a farm of a given size. If reference be made either to the requirements of old-fashioned covenants when they prescribed the quantities of dung to be applied in the course of the rotation, or the estimates of practical men when they theorized on the quantity of manure proper to be applied to each crop, it will appear that, a liberal allowance being made for the bulk of straw grown per acre, that amount must be increased four-fold at least to supply the amount of dung required.

But not to refer to bygone estimates, I will only note that Mr Morton, in his recent article, vol. xix. of Journal, p. 464, speaking of the horse labor performed on Whitfield farm, speaks of 1200 tons of dung being carted where only 120 acres of corn are grown. This would give 10 tons of dung as the produce of one acre of straw; or, supposing the litter, as assumed above, to contribute one-fifth of the bulk, and no straw at all to be consumed otherwise than as litter, we should require for this result an average yield of 2 tons of straw to the acre on autumn and spring corn alike,—assuredly a very high average. I think, therefore, that I may safely infer that in open yards the rainfall nearly doubles the bulk of the manure: the excrements, liquid and solid, representing 6 cwt. in round numbers,
the litter " 4 " " "
the rainfall " 10 " " "

in the composition of 1 ton of manure.

It is noteworthy that by using covered yards we do not so much diminish the quantity of manure which a farm can produce as alter the proportions of its constituent elements: in this latter case the litter furnishes less than one-fourth of the bulk, so that 200 tons of litter would provide for 850 tons of manure; whilst on the other hand the amount of the excrements, liquid and solid, would be doubled to attain this result, and the rain-water removed.

It may be interesting to consider what the size of a farm must commonly be which can furnish 200 tons of straw for litter, after other demands have been satisfied. The following calculations are made mainly for a light land farm, under the four-course system, as it is chiefly on such soils that a great breadth of straw is grown; and certainly for such the worth of straw, whether as fodder or litter, has a special importance. On these soils 200 acres of corn would probably be required to furnish 200 tons of straw for litter; nor, if we attempt to strike an average for the whole kingdom, will these proportions be much changed. For first, as to wheat-straw, Stephens, vol. i. 1991, cites 1 ton 7 cwt. as Arthur Young's estimate, no account being taken of the weaker soils. He then quotes Scotch authorities, giving 1 ton 5 cwt. and 1 ton 76 lbs. per imperial acre as the results of their experience; and concludes by expressing his own opinion that 1 ton per imperial acre is too high an average for Scotland.

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year round would, of course, give the same result as eight used only during six months. *Practically*, some modification will be made for the sake of economizing buildings, if not labor; but, *theoretically*, it is easiest to carry out these calculations on the author's original hypothesis.

Mr. Morton, in one of his latest papers on the forces used in agriculture, has estimated an acre of a good wheat crop, tied in sheaves, at 5,000 lbs., which seems to be a well-considered and just estimate. Now if of this there be of grain 8 sacks, weighing 18 st. each, the corn alone would weigh 18 cwts. or 2,000 lbs. nearly, leaving 3,000 lbs. as the weight of the straw, or nearly 1 ton 7 cwt.; a result coinciding exactly with that of Arthur Young.*

With respect to barley and oat straw, Stephens's estimates place them at about two-thirds and three-fourths, respectively, of the bulk of wheat straw grown per acre, or 18 cwt. and 20¼ cwt. respectively.

We may therfore safely assume *on the average*, that one acre of wheat and one acre of spring corn together will not yield more than 2 tons 10 cwt. of straw, or 250 tons from 200 acres of corn.

I come now to the consideration of the other sources of demand upon the straw-stack besides that of litter.

First we have cart-horses, consuming cut chaff:—our author speaks of 10 such horses; this would not be an adequate number for the extent of arable land we are contemplating: 13 would probably be required on an easy-working light soil—but if beasts on the average consume as much straw in the shape of fodder as horses, the result will be the same for 10 horses and 40 beasts as it would be for 13 horses and 37 beasts.

I find upon inquiry that in my cart stables there was consumed, besides corn and a moderate allowance of hay, by the young horses 10 lbs. per day, and by some older mares 15 lbs. of cut wheat straw and barley chaff.

In winter the allowance of hay would be occasionally diminished, and considerably more straw eaten in consequence; on the other hand, the short stuff from the barley-thrashing contributes considerably to the subsistence of the horses, and spares cut chaff, whether it may have been taken into account in the bulk of the barley crop, or not.

Now if 10 horses consumed 10 lbs. a-piece of chaff daily during say 8 months o 30 days (240 days), they would consume 10 tons 14 cwt. in all. I calculate therefore that they consume at least 1 ton of straw a-piece in the course of the year as cut chaff.

Next, in the case of cow stock, when these are economically fed, in those parts of England where the proportion of arable land is large, not less than 1 ton per head of straw should be assigned to them as food; for a cow having little else to live upon will consume nearly 40 lbs. a-day of straw. Growing steers or heifers, moderately supplied with corn or cake (say 3 or 4 lbs.) and roots without hay, would probably consume half this quantity of straw. Our author speaks of 14 and 18 lbs. of half hay half straw chaff as consumed by fatting oxen under cover, or in open yards. Mr. Horsfall's cows appear to be supplied with about 10 lbs. of wheat or oat straw per day, besides bean straw and from about 10 lbs. to 12 lbs. of hay. From these and like premises I conclude that cattle will, on the average, eat with advantage 10 lbs. per day of straw chaff for say 8 months, or 240 days; or 1 ton 1 cwt. in the year.

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* It is not clearly stated whether reaped or mown sheaves are intended, but this, though important in itself, does not so immediately affect the object now in view as might at first sight appear, because if the farm has not an ample supply of "haulm" for storing roots and other purposes, a greater deduction will have to be made from the total supply of straw to meet these demands.

The question further arises, how much straw will be profitably consumed by sheep where a feeding flock is kept on 400 acres of arable?

I do not, on a hasty reference to Mr. Bond's excellent paper on Stock Farming (read before the Central Farmer's Club in 1858), find any distinct answer to this question; but the perusal of this paper led me to note in my own book, the dietary of my flock of 13 score of ewes and lambs at the end of March, 1859. The ewes were then eating five fans of chaff with 1 sack of malt-combs; the lambs went forward, and had 4 stone of meal a-day besides. The fan represented approximately 6 bushels of 6 lbs. each, or 36 lbs.; so that the ewes ate 180 lbs. a-day, or nearly ⅔ lb. a-piece. Such an allowance, continued over 100 days, would require, as nearly as may be, 8 tons of straw. Besides the ewes I had about 120 ewe hoggets, which probably ate nearly ½ lb. of cut chaff, when the old ewe ate ⅔ lb. per day; 100 such hoggets would, at that rate, eat 5,000 lbs. in 100 days, or upwards of 2 tons. 80 fatting wethers also consumed a considerable amount of cut straw chaff with their cake; but as the amount of straw chaff eaten by sheep varies very much with the weather and the temperature, I shall content myself by asserting that 8 tons of straw may be economically used during the winter, for sheep feeding, on a farm of 400 acres of arable land, where a breeding flock is kept.

Thus we shall require for the fodder of 50 head of large stock, whether horses

| | |
|---|---|
| or beasts, at least | 50 tons. |
| For sheep | 8 " |
| For storing roots, when wheat is reaped, waste from thatching, making foundation of stacks, &c., say | 5 " |
| Total | 63 tons of |

straw; or fully the excess over 200 tons which 200 acres of *average* corn can be expected to produce.

This note, like the statements which prompted it, is intended to be suggestive rather than conclusive; for throughout we are only opening, not deciding, the important question of the proper use of straw on a farm.

The article before us does not profess to dispose of the scientific question of the value of straw for fodder by calculations based on chemical analysis; neither can it appeal to well-conducted experiments, instituted for the purpose of determining the relative values of (say) hay and straw, whether bean or white straw, in combination with cake and roots. These remain among the desiderata of agriculture.

The scientific debate seems to lie chiefly within the following limits:

No very broad or permanent distinction appears to exist between wheat, barley, and oat straw; that variety which is most congenial to the climate and soil of each district seems to be most palatable and most nutritious for the use of stock in that district. The amount of water in well-harvested straw seems to vary from 10 to about 14 per cent.;* the mineral ash from about 5 to 7 per cent. The two together may be taken to contain about 20 per cent., or one-fifth of the whole substance. Of the remainder some state less than 2 per cent., others more than 3 per cent., to consist of albumen, or, as others write, albuminous matter. Two and a half per cent. may be taken as a mean estimate.† There is besides a small quantity of oil, variously stated at from ½ to ¾ of a lb. per cent.

Some readers will recollect that recently Professor Nesbitt stated at the Farmer's Club, that 2 per cent., or even 1 per cent., was the utmost extent of oil that could be found in wheat straw; the above differences, therefore, lie within narrow limits.

But we have a residue of nearly 80 per cent. of carbonaceous matter, and it is about the feeding value of this matter that the conflict of opinion really takes place.

On the one side it is urged that the chief part of this matter is woody fibre, of little value, only one tenth thereof being soluble in water, or capable of being digested; on the other side, that about half of these substances exist in the form of starch, sugar, and gum, capable of digestion and assimilation, and of immediate use for the supply of the organs of respiration as far as is required, besides being further available for the formation of fat.

It would be a task of considerable difficulty even to state the theories, according to which starch may be converted into sugar, or either of these into fat, within the animal economy. Certain chemical agents are more efficacious than simple water in rendering these carbonaceous substances soluble; and there *may* be juices in the animal economy, whether acid or alkaline, that produce *results* analogous to these within the stomach of the animal; moreover, some chemical processes, such as that of fermentation, if not carried too far, may assist and prepare the way for the digestive process within. It may be that the admixture of some other kinds of food with straw may conduce to the development of these gastric juices, and to some extent exercise a *condimental* influence on the digestive process.

Practical men long ago liked to have the straw chaff for the cart horses stored some time before use, so that it underwent a gentle heating. This process is now often carried further, whether by the bruising of the clover or grass and weeds which grow together with the barley in the thrashing, or by the admixture of water or small quantities of green clover or roots with the chaff when cut.

But however capable of digestion part of the tissues of the straw may be in themselves; however we may be learning to assist nature, by, in some rude manner, cooking this food; however even the admixture of other kinds of food with straw may aid the process of digestion as well as of nutrition, yet truly scientific men must hesitate before they admit that by some unseen unexplained process the obedient particles of oxygen, hydrogen, &c., *actually do* fly hither and thither, and re-arrange themselves just as we should wish them to do, for the formation of fat and oil; whilst practical men, however decidedly they may affirm that cut straw mixed with other food *is* serviceable already, however hopeful they may be that further knowledge and experience will render it more serviceable, can hardly, from the results of their experience, support those estimates of the value of common straw, which are based on the above-named theories of nutrition: we cannot speak of oil and fat, starch and sugar, as certainly convertible substances—if not convertible terms.

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* If an exceptional analysis gives from 25 to 30 per cent. of water, this may perhaps be accounted for by early cutting or want of the usual stacking.

† Stephens, when estimating the straw crop of an imperial acre of wheat at 3,000 lbs., speaks of 40 lbs. (1.33) per cent. of gluten, a low estimate; whilst he assigns to "oil or fat" 100 lbs. (or 25 per cent.) a high estimate.

Thus far we have been speaking of the worth of wheat, barley, and oat straw, but there is perhaps a more important because a more valuable kind of straw, that of beans and peas, still to be noticed—the former kind being specially worthy of attention from the greater breadth that is grown.

It may be worth while to compare Professor Way's analysis of bean straw, as given by Mr. Horsfall in his Essay, with two analyses of hay derived from the same source.

| | Bean straw. | Hay, 1st Crop. | Hay, 2d Crop. |
|---|---|---|---|
| Moisture | 14.47 | 12.02 | 11 87 |
| Albuminous matters | 16.38 | 9.24 | 9.84 |
| Oil and fatty matters | 2.23 | 2.68 | 6.84 |
| Starch and gum | 31.63 | 39.75 | 42.25 |
| Woody fibre | 25.84 | 27.41 | 19.77 |
| Mineral matter | 9.45 | 8.90 | 9.43 |
| | 100.00 | 100 00 | 100.00 |

In these analyses several points are worthy of notice. First, the general similarity of the constituents of the bean straw and the first crop of hay, with the important exception that the former is stated to contain 16 per cent. of albuminous matter, against only 9 in the latter; in either case a quantity widely differing from the 2 or 3 per cent. assigned to such substances in the analyses of wheat, barley, or oat straw.

Again, the difference between the first and second crop of hay should be observed, because it probably arose from the latter being cut before it arrived at full maturity; and similar variations would probably be found in the straw of cereals if cut at different stages of their growth. The increase of oil and fatty matter, starch, and gum, accompanied by a proportionate decrease of woody fibre, is very instructive, and would suggest as early cutting of all plants, for the sake of fodder, as is compatible with the maturity of the grain.

But if, according to analysis, bean straw would appear to approximate to the value of hay, if not to surpass it, how comes it that its merits have not been more generally recognized and appreciated?

The best answer will perhaps be found by pointing to the somewhat similar fate of rape-cake. Until Mr. Pusey, prompted probably by the teaching of chemical analysis, advocated the use of rape-cake as food, it was called oil-dust, and used almost exclusively as manure.

Mr. Pusey called attention to the fact that, examined under the recognized heads of chemical analysis, it was equal to linseed, then the only oil-cake in use for feeding, in its constituents.

The practical man has never been able to extract as much virtue out of it as out of linseed-cake (unless it be for dairy purposes), and that perhaps chiefly in consequence of its heating qualities and pungent taste, properties of which the analysis took no account. And yet its merits for food are so far recognized, that some farmers, myself among the number, think it almost a sinful waste to drill in nice fresh rape-cake as manure.

In like manner, toughness of structure and unpleasantness of flavor may have stood in the way of the use of bean straw; yet the first objection may be overcome, and the second perhaps even converted into an auxiliary, in like manner as so many acids and bitters have been converted into stimulants.

On some few clay farms, where roots are scarce and a breeding flock is kept, the value of been straw has been partially recognized as winter stover for the ewes, which, however, only pick over the dried leaves and smaller stalks at the barn door; but in this manner, as also when it is furnished to cart horses for winter stover, but little of the crop is consumed as food, the great bulk being converted at once into manure.

No observations on this subject, however incomplete, especially if they would guard against exaggerated estimates as to the convertibility of straw into flesh and fat, can pass without notice the feeding experiments of Mr. Horsfall.

That gentleman has undoubtedly had great success with his stall-feeding, on a system in which straw plays a very important part; and undoubtedly he has rendered great service to agriculture, by the public-spirited manner in which he has been at the pains to communicate the results of his valuable experience to the world at large.

His practice combines two or three distinguishable and peculiar features:

1st His food is chiefly steamed; and much may depend on the sound discretion exercised, as to the amount both of moisture and of heat to be left in the mixture at feeding time.

When I have known the steaming process to be imperfectly tried, the animals became restless, and the food passed too quickly through them, probably from want of due precaution in these respects.

Again, the materials used by him under the denomination of straw are various, and generally blended together; so that it remains uncertain to which, or to the combination of which, the chief merit of the result is due.

He uses wheat straw; and, again, the husks of the oat (not oat-flight, but the husk or refuse of fine oatmeal); and, thirdly, bean straw.

Speaking from conjecture, I should assign the lowest place to the first-named and the highest to the last-named ingredient, with an inclination, perhaps, to attribute the most benefit to that element which has been tested and tried the *least*, in accounting for an unusually successful result.

There is much that calls for further investigation in these experiments; but we may congratulate Mr. Horsfall on his success, and try to emulate it, with the assurance that the comparison of attempts, whether successful or the reverse, will ultimately disclose the point on which success hinges, if, as we can hardly doubt, that result be attainable.

The importance of the subject of the economical production of beef cannot be doubted at the present moment, when the system of fattening stock at a loss, with a view to being remunerated by an increased produce of grain, seems to be drawing to an end, whilst the demand for meat is on the increase.

The more a man feels assured that statements of direct profit by stall-feeding bullocks will not bear inspection, or, at the best, only apply to exceptional cases, the more anxious he must be that more economical methods of producing beef should be recognized, than those which have hitherto prevailed.

If we would see how, in theory, a high value may be assigned to straw, we need only take the hypothesis that it contains 30, or, as a maximum, 40 per cent. of gum, starch, sugar, &c., and that these substances are worth 1*d.* per lb.

One ton of straw would then contain $\frac{30}{100}$ of 2240 lbs. of starch, &c., which at 1*d.* per lb. would give us the following value: $\frac{30}{100} \times 2240d. = 3 \times 224d.$ $= \frac{3 \times 224}{3 \times 4} = 56s.$ per ton; or, in the case of 40 per cent. of gum, starch, &c., $\frac{40}{100} \times 2240d. = 4 \times 224d. = \frac{4 \times 224}{3 \times 4} = 75s.$ nearly per ton.

If we are at all prepared for such results, we shall not demur to the phosphates in straw being valued quite as highly as when they are found in any other form.

We shall not dwell upon the improbability of any practical farmer buying potash at the price at which it is sold as an article of commerce.

We shall hardly pause to inquire why scientific writers are not now content with valuing nitrogen at 6*d.* per lb., the price it bore in the most palmy days of the nitrogen theory.

On the other hand, if carbonaceous matter be so valuable to the animal, we may rather demur to its utter depreciation in the shape of manure, as food for the plant; for the narrow-leaved grasses at nearly all the stages of their growth, and for the broader-leaved tribe at the time of their early development.—P. H. F.

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## *Letter from* MR. JONAS, *communicating a Plan for Cutting and Storing Straw chaff to the best advantage.*

July 17th, 1860.

MY DEAR SIR:—I have just invented a plan for cutting straw into chaff, which gives me much satisfaction. I have purchased of Mr. Maynard of Whittlesford, in this county, one of his powerful chaff-cutters, with sifting apparatus attached, which cutter I can work from a wheel or drum attached to my threshing-machine, which is driven by a 9 horse-power steam-engine at the same time that I am threshing corn. The straw, when delivered from the threshing-machine, is carried up an inclined plane by spiked rollers to a height of about 9 feet; it then comes down an inclined rack, nearly yelmed and ready for cutting into chaff. Three men yelm the straw, mixing with it a small quantity of green fodder, such as rye or tares. When cut into chaff, it is sifted and carried into an empty barn or chaff-house and well trodden down, and about 1 bushel of salt mixed with a ton of chaff, so as to cause a fermentation. All this is effected with no more manual labor than would be required to take away the straw and stack it in the ordinary manner. Within the last few days I have threshed and dressed the corn, and at the same time cut the straw into chaff from the produce of about 80 acres of wheat, at a cost, too, not exceeding 45*s*., or 7*d*. per acre for cutting the straw produced on an acre of wheat. This chaff I shall not use until next October, when I purchase my beasts for winter grazing, and none but those who have tried this plan of old chaff so managed, as compared with fresh-cut chaff, can believe the advantage in value of the old chaff for feeding stock. I can work off the produce of about 8 acres of good strong wheat per day, thus cutting about 800 fans per day, the chaff being cut shorter and better than by the hand-box.

Three men yelm the straw and feed the chaff-cutter, and if the threshing-machine be placed near the barn or chaff-house which is to be filled, two men can carry the chaff into the barn; two or three boys should tread it down close, so as to cause it to heat. The only extra expense is for from 4 to 5 cwt. of coal per day. If, however, the straw is stacked as threshed and cut into chaff afterwards, the expenses of cutting and sifting with Maynard's chaff-cutter would be as follows:

| | £. | *s*. | *d*. |
|---|---|---|---|
| 1 man to move the straw from stack to men to yelm | 0 | 2 | 0 |
| 4 men to yelm straw | 0 | 8 | 0 |
| 2 men to carry away chaff | 0 | 4 | 0 |
| 3 lads to tread chaff down, 6*d* | 0 | 1 | 6 |
| Hire of engine and chaff-cutter (this includes 1 man to feed chaff-cutter and engine-man) | 1 | 10 | 0 |
| Coals, 5 cwt | 0 | 4 | 6 |
| Water, carting | 0 | 2 | 0 |
| | £2 | 12 | 0 |

This will cut from 600 fans* to 900 fans per day, according to the length of cut: the first cut being about 3-16ths of an inch in length, the latter about 3-8ths. The cost would be, the very short cut, 1*d*. per fan; the latter cost 1-3rd of a penny per fan; but, by cutting the chaff at the same time you thresh, you save 47*s*. per day, or, in fact, cut 800 fans for 4*s*. 6*d*.

Yours faithfully,

*P. H. Frere, Esq.* Samuel Jonas.

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* Mr. Jonas reckons a fan of chaff to measure 5 bushels, and to weigh 28 lbs.—P. H. F.

# ESSAY

## ON THE EPIZOÖTY, LATELY PREVALENT AMONG SWINE.

BY EDWIN M. SNOW, M.D., OF PROVIDENCE.

WITH THE RESULTS OF POST-MORTEM EXAMINATIONS,

BY G. L. COLLINS, M.D., OF PROVIDENCE.

*Read, by request, before the Standing Committee of the "Rhode Island Society for the Encouragement of Domestic Industry," July* 17, 1861.

Among the subjects intimately connected with the science of medicine, and interesting to every intelligent physician, there is none of greater importance than the relations which exist between epizoötic and epidemic diseases. That such relations do exist seems to be evident, and numerous facts could be produced to prove it; but the character of these relations and the measures necessary to prevent their effects, are not fully known.

But my purpose, on the present occasion, is not so much to discuss this question as to call your attention to a single epizcötic disease which has prevailed with great severity in some portions of this country, and to some extent, in nearly all portions of it, within the last six or eight years. I do this, confidently expecting that if an interest is excited in this disease, you will not only be led to watch its progress and observe its symptoms, but that you will also endeavor to ascertain the relations which are supposed to exist between it and certain epidemic diseases.

The disease referred to, which, for want of a better name, has been improperly called "Hog Cholera," has prevailed in this vicinity, more particularly among large herds of swine, during each of the last five winters; but has usually terminated with the end of cold weather. During the winter just past, it has been more severe than in any preceding, and has prevailed, more or less, in most of the towns in this vicinity. The present season it has not, as heretofore, ceased with the cold weather; but has continued until the present time, and during the last five months has destroyed more than 300 hogs in the towns of North Providence, Cranston, and Johnston. During the last week in May, 20 grown hogs and from 30 to 40 pigs died with this disease, at the Field's Point farm, in Cranston, comprising nearly the whole herd at that place. I have also heard of its prevalence in various towns in Massachusetts, during the past winter. In the month of February my attention was called to the subject, and in company with several physicians of this city, visits were made to diseased hogs in Cranston and North Providence. Post-mortem examinations of hogs which had died with the disease, were made by Drs. G. L. Collins, J. W. C. Ely, and others, a minute account of which will be given hereafter. Particular inquiries were made of the owners and others, in relation to the symptoms and progress of the disease, and I have also obtained some facts by correspondence with parties at the West, where the disease first commenced.

The results arrived at, I propose to give briefly.

*Symptoms.*—The symptoms, as described by non-professional persons, are as various as can be imagined. No two persons agree, and no two cases of the disease are described alike. It is probable that if the disease could be carefully watched by persons accustomed to such observations, a more correct and uniform series of symptoms would be found. By condensing and arranging, as far as possible, the confused and blind accounts given by the owners of the animals, and by combining the results of our own observations, the sensible symptoms are found to be somewhat as follows:

1. *Refusal to eat.*—This is the first symptom usually noticed by those who have the care of the animals, though as will be seen hereafter, it is by no means the first symptom of the disease. The refusal of food continues through the whole sickness; and food of every description, solid and liquid, is refused.

2. *Great thirst.*—This is constant, and large quantities of cold water will be swallowed if it can be obtained. Even after the animal cannot stand alone, it will drink cold water with avidity.

3. After a time, the length of which varies very much, the animal begins to show signs of weakness; reels, staggers, and, in attempting to walk, often falls down.

4. In most cases there is a diarrhœa, with copious fluid discharges of dark, bilious and very offensive matters. In a few cases, there is no diarrhœa, but evacuations of hard, black balls; but in these cases the fluid offensive matter is often found in the intestines after death.

5. In a few cases there is vomiting; but this is not often severe, nor is it continued for any length of time.

6. The external appearance of the animal is at first paler than usual; but towards the last of the sickness, purple spots appear, first on the nose and sides of the head. These extend along the sides and belly, and between the hind legs. When the purple appearance reaches this extent, the animal soon dies.

7. In many cases, perhaps a majority, ulcers are found on different parts of the body. These were particularly noticed on the inside of the lips and gums, and on the feet, and were often quite deep and excavated. In some cases, these ulcers were seen in the nostrils, and in one case there were extensive ulcerations on the tonsils.

8. In a few cases the legs are swelled, and the animal is lame; sometimes the ears and other parts of the body are swelled and red; sometimes the eyes are sore and inflamed; sometimes carbuncular swellings are found, and generally the lymphatic glands seem to be enlarged.

9. In most cases the pulse is quickened, the respiration is hurried and difficult,

and there is much cough. But in some genuine cases of the disease, there is no perceptible trouble with the lungs, and no important lesions are found in them after death.

10. The duration of the disease, in fatal cases, after the first symptoms are noticed, is extremely variable. Some we have seen which died within two or three hours; others live many days. All judgment, however, in relation to this point, is extremely uncertain. The first symptom observed is usually the refusal of food; but it is probable, indeed it is certain, that the disease is progressing for a considerable period before this symptom is noticed. Cases like the following are sometimes seen: A hog refuses to eat, it soon grows weak, staggers in walking, turns purple on the sides and belly, and dies within two or three hours after the first symptom was noticed. But on examination after death, evidences of extensive disease are found at a stage of development which must have required many days to reach.

Such are, briefly, the sensible symptoms of the disease, as obtained from the descriptions of those who have the care of the animals, and from our own observations. I will now read the description of the symptoms, as published by Dr. George Sutton, of Aurora, Indiana, in February, 1857. Dr. Sutton says:

"The first symptoms that can generally be discovered, the hog appears weak, his head droops, and frequently, in a few hours after these symptoms, diarrhœa commences, which has caused the disease to receive the name of 'Hog Cholera.' Frequently there is vomiting: sometimes from the bloody discharges, the disease resembles dysentery. In other cases, the lungs are principally affected, and there is difficult breathing and cough. Sometimes there is inflammation of the throat, and the tongue is also very much swollen and inflamed; sometimes there is bleeding from the nose, and the nose is swollen. In many, the disease appeared to be principally confined to the surface, and sometimes the ear and side of the head were swollen and inflamed; sometimes one or both legs were inflamed and swollen, and the inflammation extended along the sides or belly, of a deep red color, almost precisely similar to phlegmonous erysipelas. Some had large sores on their legs, resembling carbuncles; others had gangrenous sores on their sides or flanks, from 3 to 6 inches in diameter; some appeared delirious, and others blind. These symptoms were combined in almost every possible variety; death took place in from one to five days. Out of a pen containing 100 hogs fed on slops, 33 generally died, and it required about eight weeks for the remainder to recover from the disease."

The symptoms, as described by Dr. Sutton, have a general similarity to those observed in this vicinity—sufficient to show that they refer to the same disease.

### POST-MORTEM APPEARANCES.

The following account of the post-mortem appearances has been prepared by Dr. George L. Collins, of this city, and is given in his own words:

"Case I. The first hog examined was at Thomas Carron's pen in Cranston, February 9, 1861. Present, Drs. Snow, Ely, and Caswell. The subject was a sow, in poor condition: would weigh from eighty to ninety pounds. She had been sick for several days, and was but just able to walk with a feeble, tottering step. The skin, on the ears and the tail, presented purple patches, and some spots were noticed upon the belly and legs. The animal was killed by bleeding.

"There was scarcely any fat upon the viscera. The lungs were collapsed, but healthy, with the exception of the most depending portions, along the anterior border, where, to a slight extent, there was an appearance of congestion, with a deficiency of air in the part; giving a condition almost perfectly resembling antelectasis, as seen in a newly-born infant. The heart was healthy. The stomach was healthy. It was pretty well distended with an offensive compound of food. The small intestine contained some yellowish, thin matter, and about two dozen worms—*ascaris lumbricoides;* this portion of the intestines appeared healthy. The large intestine, as had been previously the small, was opened throughout its whole extent, and carefully washed. In the cæcum were found two ulcerated patches, each three-quarters of an inch in diameter. The whole mucous surface of this portion of the intestine was softened, so that it could be easily scraped off with the handle of a knife. The muscular coat was, also, thought to be softened; allowing the intestine to be more readily torn than in the healthy state. The color, in some portions, was much darker than normal. The other organs appeared healthy, with the exception of the kidneys, which were of a yellowish-brown color; quite changed from the healthy character. The bladder was empty. In the omentum were two cysts, about an inch in diameter, each of which contained an *echinococcus.*

"Case II. At this visit we saw a boar, probably of two hundred pounds weight, which had been sick with the disease more than a week, and was thought to be getting better. He presented no marked symptoms; no cough nor quick breathing. At our next visit to this pen, February 13th, four days after the first, this animal was found dead, and was examined by Dr. Ely. The same medical gentlemen were present as before.

"The mouth was normal. The surface of the skin was very much marked by purple discolorations, particularly upon the ears and the tail, and the depending portions of the body. The heart was healthy. The left lung was mostly healthy. The depending portion exhibited the appearance of congestion, as observed in the first case. The right lung was adherent to the costal pleura by recent adhesions. Nearly the whole of it was in the second stage of pneumonia; a portion of it was passing into the third stage. The stomach presented one patch of ulceration, on the mucous membrane, about half an inch in diameter; otherwise it was healthy. The intestines were opened throughout the whole extent, and washed. The small intestine contained a little thin, yellowish matter, a few worms, and appeared healthy. The large intestine showed no ulceration; but the mucous membrane was thought to be softer than in the healthy condition. The kidneys were of a yellowish color, as if fatty. The bladder contained four ounces of urine. The other organs were healthy.

"I examined a portion of one kidney with the microscope, and found it quite fatty. Much of the epithelium from the tubuli was washed out.

"The urine let fall, on cooling, a copious deposit of urate of ammonia. Its specific gravity was 1.022. It was slightly albuminous. The microscope revealed granular and epithelial casts, and much kidney epithelium.

"Case III. February 26th, we visited John Gillon's pen, in North Providence, where we examined three animals: two that were already dead, and one that we killed. Present, Drs. Snow, Ely, C. W. Parsons, Brown, Carr, and Caswell.

"The first was a barrow, in good condition, and weighing about two hundred pounds. He had been sick two weeks. The mouth was a little frothy. No spots upon the surface. Not much post-mortem rigidity of body. The heart was healthy. The right lung was in the third stage of pneumonia. It was attached to the costal pleura by pretty firm adhesions, and presented a tuberculous appearance throughout. In the depending half of the left lung there was hepatization, with the appearance of very fine miliary tubercles in some portions. This deposit appeared to commence in the air vesicles, and in the finest bronchial ramifications, gradually increasing and thickening, until it presented the nodulated aspect as seen in the right lung. A portion, examined with the microscope, presented the usual appearance of true tubercle. The intestines were not opened. They were filled with fecal matter, which, in the large intestine, was of the consistency observed in the healthy animal. A portion of the large intestine, which was observed to be dark and discolored, being cut off, presented an ulceration on the mucous surface, as large as a three-cent piece. The liver was yellow, and slightly fatty under the microscope. The kidneys were slightly more yellow than normal.

Case IV. The next subject was a sow, in poor condition. Her weight was, perhaps, one hundred pounds. Post-mortem rigidity well marked. The surface of the skin was much discolored by the purple patches. She had been sick more than two weeks. The heart was normal. The pericardium contained two ounces of yellowish liquid, which had coagulated around the heart. The depending half of each lung was in the second stage of pneumonia, and slightly adherent to the opposing pleura. The other portions were healthy. The large intestine, only, was opened. There were no ulcerations. It was thought to be a little more fragile than in health. The kidneys were too pale and yellow. The other organs were in the normal state. A little mass was found on the intestine—or on the omentum where it united with the intestine—about the size of a pea, which resembled tubercle.

"Case V. This was a sow in poor condition. She had been sick but a few days. She was able to walk about, though very feeble. The respiration was hurried. The surface of the skin was much discolored. She was killed by bleeding.

"The heart was healthy. The left lung was healthy, with the exception of a small portion of the depending edge, which was passing into hepatization. The right lung was completely hepatized; a portion of it had already reached the third stage. The opposing pleuræ were adherent where hepatization had taken place.

The large intestine, only, was opened. It contained a dark, thinnish, tar-colored substance. There were no ulcerations. The mucous membrane was thought to be softened, as in other cases. The kidneys were very pale, almost straw-colored. A portion of one, examined by the microscope, was found slightly fatty. The bladder contained two ounces of urine;—of the specific gravity of 1.020—and highly albuminous. It presented, with the microscope, granular casts, and some fatty epithelial cells. The urine, on examination, was found greatly deficient in chlorides. The serous surfaces were everywhere studded with minute purpuric spots. The same kind of blood points were found throughout the substance of the kidneys.

"CASE VI. March 1, we again visited John Gillon's pen. On this occasion we examined three animals—two of them we found dead, and one we killed. Present, Drs. Mauran, Snow, Ely, N. Miller, Brown, Carr, Stickney and Caswell.

"The first examined, on this occasion, was a sow, six months old, in poor condition;—her weight about one hundred pounds. She had died but a few hours before our visit. She had been sick two weeks. She had had some cough;—had not purged. There were a few purple spots about the head. The heart was normal, with the exception of a few purpuric spots upon its surface. The depending half of the left lung was hepatized;—a portion of it passing into the third stage. Five-sixths of the right lung was hepatized;—mostly in the third stage. The remaining sixth (the upper portion) was healthy. Both lungs were adherent to the costal pleura over the portions hepatized. The liver was congested, giving it a dark color. The kidneys were congested. The cortical substance was less yellow than in any previous subject, though lighter than in health. Not more than a drachm of water was found in the bladder. The stomach and the small intestine appeared healthy. The stomach contained some food, and the small intestine, a little thin, yellowish matter. The large intestine was opened and carefully examined. It was well filled with pretty hard, fecal matter. The tissue appeared softened and tender, as in former cases. Many of the solitary glands were enlarged, and ulcerated at the apexes. Ulcerations were found in this animal about the lips and gums. One foot was sore just under the dew-claws.

"CASE VII. This was a young sow, but two months old. She had been sick a month;—emaciated. Her weight was about twenty pounds. She had been dead but a few hours. The examination was made by Dr. Ely, to whom I am indebted for the following notes: There were no purpuric spots on the skin. The lips and gums were ulcerated. The heart was healthy. The lungs were not adherent in any place. They were slightly congested, and, along the depending edge, to a slight extent, presented indications of the first stage of pneumonia. The liver was healthy. The kidneys were pale and yellowish. There was a little water in the bladder. The stomach and small intestine were healthy. The large intestine was opened, and found ulcerated upon the mucous surface in its whole extent, with the exception of about four inches of the rectum, and one small spot near the cœcum. The tissue was thought to be softer and more fragile than in the healthy state.

"CASE VIII. This was a sow, about seven months old—in poor condition. Her weight was judged to be about seventy pounds. She had been sick two weeks;—had never purged. Her respirations were counted, and found to be sixty-four in a minute. She was killed by bleeding.

"No purple spots were observed upon the skin. Ulcerations were found about the lips and gums. They were, as in other cases observed, oblong in shape, and resembled eschars formed by the actual cautary. The depth was about one-eighth of an inch. The left fore-foot was ulcerated between the hoofs. One quart of straw-colored fluid was found in the abdominal cavity, and one ounce in the pericardium. The serous membranes presented purpuric spots in abundance. The heart was healthy. One-fourth of the left lung was found in the second stage of pneumonia and tuberculous. The tubercles were mostly small; but a few were larger, and showed softening in the center. Most of the right lung was congested, and much of it hepatized. A portion of it was tuberculous. Fine miliary tubercles were observed where there was no pneumonia, and some hepatized portions contained no tubercles. Both lungs were adherent over the hepatized portions. In this case, as in every other examined, the anterior or depending portions of the lungs were the parts suffering most from inflamation. The liver was healthy. The kidneys were quite yellowish. The stomach and the small intestine were healthy. The solitary glands in the large intestine were congested—some were enlarged and ulcerated upon the apexes. This portion of intestine seemed softened and tender. The contents appeared in a healthy state. The bladder contained two ounces of urine, which was found to be slightly albuminous, and deficient in chlorides. There were no casts. Two cysts containing *echinococci* were found in the omentum.

"CASE IX. May 31st, I visited, with Dr. Snow, Mandly B. Hart's pen, at Field's Point, in Cranston, where I made an examination of a sow ten months old. She was in good condition;—had been sick six days;—had not vomited nor purged. She miscarried, with eleven weeks' pigs, two days before, which were all dead. She appeared sick and weak—refused food, but would take water.—The breathing was quick and hurried, and the nostrils seemed obstructed. Purpuric spots were appearing upon the ears and the belly. She was lame in the right fore leg, which was swelled about the knee joint. She was killed by bleeding.

"Ulcerations were found upon the lips, upon the tonsillary glands, and at the base of the epiglottis. A false membrance was found obstructing the nostrils, for three inches of the anterior portion, under which the mucous membrance appeared ulcerated. About the swollen joint of the leg lymph was found effused, which was breaking down into pus. The heart was healthy. The right lung was nearly healthy. It was a little congested at the anterior border—no adhesions. The left lung was partially adherent to the costal pleura. There was a mass of gray hepatization, about as large as the closed fist, situated in the middle lobe and reaching to the base of the lung. It had a well-defined border, and passed abruptly into healthy tissue. The liver was healthy. There were several ounces of serum in the abdominal cavity. The stomach and intestines appeared healthy. A portion of the large intestine was examined upon the mucous surface, but presented no sign of ulceration or softening. The kidneys were of a pale yellowish color. The bladder contained eight or ten ounces of urine, which let fall some urates on cooling, and gave slight indications of albumen. The uterus appeared healthy upon the serous surface, but internally it presented a dirty-looking, suppurating surface. No purpuric spots were found upon any of the serous surfaces. The lymphatic glands were generally enlarged, particularly those about the angle of the jaws.

"We have here, then, the results of nine post-mortem examinations. Five of them were made upon animals dying of the disease, and four upon animals in the last stages of the disease, which were killed for examination. The latter were good representative cases, and for purposes of classification may be reckoned with the others.

"In grouping, therefore, the pathological appearances observed, we find that purpuric spots upon the skin existed in six cases; in three of which they were very extensive. In two cases, purpuric spots were observed upon the serous membranes.

"The feet and legs were not particularly examined in the first five cases. In the remaining four, two were found ulcerated, one was lame about the knee-joint, and one was well.

The mouth was not examined in three cases. In the remaining six, four presented ulcerations. In one there were ulcerations upon the tonsils, at the base of the epiglottis, and within the nares; where there was also a false membrane. This was, in fact, the only case where the throat and nares were dissected.

"The heart was healthy, excepting effusion into the pericardium, which in only one case was considerable.

"The lungs in two cases were almost healthy. In seven there existed hepatization; in five of which it was observed, to a greater or less extent, upon both sides. In one case one lung was tuberculous, and in another both. In every case where hepatization was found, there existed also plural adhesions. Where only a part of a lung was hepatized, with one exception, it was the anterior or depending portion; the rule being reversed from that observed in the human subject.

"The stomach was generally in a healthy condition. In one case there was ulceration of the mucous surface to a small extent.

"The small intestine was in a healthy condition. Worms were found in two cases.

"The large intestine was most frequently in a state of disease. In five cases it was ulcerated to a greater or less extent, and in six it was thought to be somewhat inflamed and softened.

"The liver was generally sound. In one case it was a good deal congested.

"The kidneys were in every case pale, and of a yellowish color; this condition was well marked. In two cases the microscope showed them to be fatty.

"The bladder was generally healthy.

"The urine was examined in four cases, in all of which it was more or less albuminous, in one case very much so. In two of these cases granular and epithelial casts were observed; in the other two none. In two cases, in which the lungs were greatly hepatized, the urine was tested, and found deficient in chlorides.

"In two cases serum existed in the abdominal cavity, and also in the thorax."

It would be superfluous, were I able, to add any thing to the preceding full description, by Dr. Collins, of the post-mortem appearances; but it may be interesting to add a brief account of these appearances as described by Dr. Sutton, of Indiana, four years since. He says:

"On opening the bodies, I found the appearances of the disease as various as the symptoms were different. I examined 47 hogs that had died of this disease, and scarcely found two that presented precisely the same appearance. In every instance there was evidence of a diffusive form of inflammation, which was not confined to any particular tissue. The skin was generally of a purple appearance, and, in cutting through those parts which were most inflamed, the cellular tissue was infiltrated with serum, and the skin was swollen. In nearly every case the mucous membrane of the stomach is more or less inflamed, presenting a bright red appearance, tumid, and frequently softened. Sometimes there was an effusion of blood into the stomach, and this organ was frequently found distended with food. In all cases where there had been diarrhœa or dysentery, the mucous membrane of the large or small bowels presented evidence of inflammation. Sometimes the bladder was inflamed, and occasionally contained an effusion of blood. The peritoneum, in eighteen cases, presented marks of inflammation; there was effusion of bloody serum, and adhesions between the intestines, and between the intestines and sides of the body. In three cases there was effusion of blood into the peritoneal cavity. Suffice it to say that I found the liver, the lungs, the pleura, the peritoneum, the mucous membrane of the bronchia, the trachea, and larynx, all at different times bearing marks of inflammation; frequently one or both lungs were engorged or hepatized, and adhering to the ribs. The lymphatic glands were generally inflamed, or greatly congested, resembling lumps of coagulated blood.

"These are some of the facts revealed by our dissections, which show this disease to produce a diffusive form of inflammation, which attacks the skin, the cellular, the serous, the mucous, and the glandular tissues. It spreads along these tissues very similar to the manner in which an erysipelas spreads along the tissues in the human system, and in some respects resembles that disease."

Such are the facts relating to the symptoms and post-mortem appearances of this disease, as learned from my own observations and from the observations of others. Perhaps it might be the part of wisdom to confine myself to the facts, and to refrain from entering upon the field of theory and speculation. But this plan would hardly satisfy your expectations, and would certainly fail to satisfy my own inclinations. Besides, it seems to me that the facts are sufficient to justify something more than speculations, if not to establish a theory on sure foundations.

The first question which arises in the minds of those who are acquainted with the facts, as well as in the minds of those who know nothing about them, is this: What is the disease? In this case, as in all similar cases, those who have the least knowledge upon the subject are the most positive in their opinions, and are ready to state at once the nature of the disease, and to give it a definite name.

This, after a careful study of the facts, I cannot do. I know of no name which would convey to medical men, and certainly not to others, a precise idea of the nature of the disease. Yet it seems to me that the facts as already given cannot fail to suggest to those familiar with diseases some idea of the character of the disease under consideration.

As we read of enlarged glands, ulcerated intestines, carbuncular swellings, inflamed and hepatized lungs, purpuric spots, and other similar symptoms, as found in animals in this disease, the mind of the physician at once reverts to pyæmia, phlegmonous erysipelas, typhus fever, and other like forms of asthenic disease in the human system. Here I am satisfied we have a clue to the true nature of this disease. It is a disease primarily of the blood, producing a depraved state of the system generally—a genuine typhus disease; call it *typhus fever*, if you choose, though this name is not at all satisfactory. The diarrhœa which often occurs in typhoid fever is not a "Cholera," neither is the diarrhœa of this disease in hogs a "Hog Cholera;" but it probably arises from the same cause as the diarrhœa in typhoid fever. The disease is in the system generally; the diarrhœa is a local complication or effect of the general disease. Neither is this disease a pleuro-pneumonia, properly, though there is pleurisy and pneumonia existing in perhaps a majority of cases. It is a general disease of the system; the pleuro-pneumonia is only a local complication or effect of the general disease. It is well known that cases of pyæmia, as well as of low typhus and typhoid fever, in human subjects, are often complicated with pneumonia. So in this disease the pleuro-pneumonia, the diarrhœa, the ulcerations in the large intestines, the purpuric spots, the ulcers about the mouth, feet, and elsewhere, are only local effects of the general disease of the system.

It seems to me that physicians will obtain from this description a true idea of the nature of this disease, while any attempt to give it a definite name would only "darken counsel" upon the subject. Definite names have, however, been given to the same disease. Dr. Sutton, already quoted, says:

"We consider this disease has not its exact resemblance amongst the diseases to which the human system is subject, and consequently we know of no appropriate name to call it. From the inflammation of the lymphatic glands, and the formation of sores like carbuncles, it in some respects resembles the plague, and I know of no better name to call it than the PLAGUE."

Some two thousand years since, Virgil described a "highly inflammatory fever among cattle, accompanied with tumors, carbuncles, ulcers, and purulent deposits throughout the whole body," to which the name of "*Murrain*" was given. Any one who reads his description, as well as those of numerous other writers in every century since, as given under the article "Murrain" in the "*New American Cyclopædia*," cannot fail to see striking points of resemblance between that disease among cattle and the present disease among hogs. I am satisfied that the diseases are very similar, if not identical.

The symptoms and post-mortem appearances of the disease among cattle, which has caused so much excitement in New England during the past two years, under the name of pleuro-pneumonia, are almost precisely the same, so far as they relate to the lungs, as in the disease among swine which we have examined. Whether the pathological changes in other organs of the body are similar in the two diseases I am unable to determine. I have never seen the disease in cattle, called pleuro-pneumonia, and in all the accounts of post-mortem examinations published by the Legislative Committee of Massachusetts, there is no report of the examination of any organ in the body but the lungs, except an occasional, incidental allusion to the heart and liver. Though diarrhœa, and "scouring of green fetid dung," were described as marked symptoms of that disease, there is no published evidence that the intestines were examined in any case.

Those who have seen the disease among swine, and who have read the evidence relating to pleuro-pneumonia, so called, must at least have very strong suspicions that the diseases are similar, and that the term pleuro-pneumonia is a misnomer.

Shall we not conclude, then, that the "plague" of Dr. Sutton, the "hog-cholera" we have described, the "murrain" of Virgil and of all ages since, and the "pleuro-pneumonia" of Great Britain and of New England, are similar diseases, having the same general features, presenting similar pathological changes, and are the result of similar causes?

It remains to add a few words in relation to the causes of the disease.

In this disease, as in all epidemic diseases of the human race, the universal tendency is to ascribe its propagation to *contagion*. Dr. Sutton says:

"Although this disease must occasionally have a spontaneous origin, yet, when once produced, it will spread rapidly by contagion."

The Commissioners of Massachusetts, in their investigations of the cattle disease, seem to have taken it for granted that it was a pleuro-pneumonia only, and that it was contagious.

Though want of time forbids the discussion of this question, I must think that there are not sufficient grounds for this opinion. It is comparatively but a few years since the belief was universal that yellow fever was contagious, and the most oppressive and inhuman restrictions, handed down from the dark ages, were enforced to prevent the disease, in every port of the civilized world. The same was true of cholera; and in this State, within the memory of most of those before me, persons have been forbidden to land because they came from a neighboring city where cholera existed.

And yet the enlightened opinion of physicians of the present day has formally condemned, and will soon entirely put an end to, the quarantine of *persons* on account of yellow fever; while the idea that cholera is contagious, is, so far as I know, abandoned by all intelligent physicians at the present time.

So, I firmly believe, it will soon be with reference to the disease among animals which we are considering. But this disease is an epizoöty, or perhaps we may more intelligibly say (though the expression is incorrect) that it is an epidemic disease among animals.

If an epidemic disease, then its primary cause is similar in its operation to that of other epidemics. What this primary cause of epidemics is—whether animal, vegetable, or chemical—no one at the present day can satisfactorily explain. It probably exists in the atmosphere, progresses over a greater or less extent of country, in accordance with laws with which we are not acquainted, and alights upon the earth and produces its effects wherever, within the limits of its progress, it finds local circumstances adapted to its propagation. The following, then, as I understand the subject, are the causes of this disease among swine, and probably also of the disease among cattle, as well as of epidemics among men, viz.:

1. An epidemic atmospherical poison.
2. The local circumstances adapted to receive and propagate the poison existing in the atmosphere.

The co-existence of both these causes is essential to the development of the disease. When both these causes are present in any locality, and healthy animals are brought within the limits of their influence, a certain portion, sometimes all, will contract the disease. Both the causes above named may exist in a locality whether there are any animals there or not. *This is infection,* and this is the manner in which epidemic diseases are propagated. That *it is not contagion,* is proved by the fact that diseased animals, when removed from the infected locality to places where the two causes above named do not exist conjointly, *cannot possibly communicate the disease to other animals.* I know of instances in which this experiment has been tried, in this disease among swine.

*Contagion* originates only in living animal bodies, and communicates disease from the diseased animal itself, wherever it is present, in any and in all localities; and the animal itself, independent of atmospheric or other external circumstances, is the source from which the disease is propagated, either directly or indirectly.

*Infection* originates in inanimate bodies, and can increase and communicate disease *epidemically,* only in localities where the atmospheric poison is present.

But it was not my intention to enter upon the discussion of this highly interesting subject.

If then this disease be, as I fully believe, an epidemic, infectious disease, caused by an atmospheric poison acting in combination with local conditions adapted to a propagation of the poison, the indications for its prevention are plain. They are, to remove as far as possible the causes.

The cause existing in the atmosphere cannot be avoided except by removal beyond the limits of its existence; and this is not usually practicable. But the local conditions necessary to propagate the disease can, to a very great extent, be prevented.

These local conditions are, briefly, impure air arising from filthy pens and particularly from crowded pens, combined with unhealthy food and the want of pure water. It is not necessary to show the importance of preventing these, nor the manner in which it can be done.

With regard to the *treatment* of the disease, very little need be said. I do not believe that treatment of any kind is of any value whatever. If successful, it will cost much more than the animal is worth; but it will very rarely, if ever, be successful in removing the disease from the system, and success in lengthening the life of a diseased hog is hardly worth the trouble necessary to secure it.

If, however, the trial is desired, the indications for treatment are obvious. They are to support the system by stimulants and tonics, with pure air and pure cold water, and nourishing, healthy food. Chlorate of potash in large doses has been recommended.

I am not ignorant of the fact that "certain cures" for this disease, as well as for cholera and other epidemics, are plenty in every neighborhood. These "certain cures" are usually kept secret, and have never yet been known to exert the slightest influence upon the progress or mortality of the diseases to which they are applied. While writing this paper, I hear of certain cures for this disease which the possessors refuse to disclose. Their most positive assertions fail to convince me that a disease which from its very nature must be in most cases incurable, can be certainly cured in all cases; while their refusal to make known their remedies to the world proves that whatever may be the remedies, they certainly are entitled to little respect.

There are several other points connected with this subject, upon which I had intended to make some observations; but this paper is already extended far beyond my expectations, and beyond the limits of your patience.

The subject, though not precisely of the character usually presented on these occasions, is of great practical importance to the community, and it is the duty of physicians to understand it, and to be able to give advice when needed.

The victims of this disease among swine are already numbered by hundreds of thousands, if not by millions, in the Western and Southern States, and we shall undoubtedly see more of it in New England. In February, 1857, Dr. Sutton, of Indiana, stated that 60,000 hogs had already died with this disease within 100 miles of Cincinnati.

The subject is also important and of the highest interest in view of the relations, to which I have already alluded, of this disease to the disease among cattle, and to certain epidemics which afflict the human family. The subject is also not without interest in its relations to the supply of food for cities. In my opinion, pork in its best estate is by no means desirable for food; and diseased pork is certainly less so. I have already had occasion to know that all persons are not governed by the Christian rule of doing as they would be done by, in this respect; and that some persons will send pork to the city markets which they would not eat themselves.

I have good reason to believe that on the appearance of the first symptoms of the disease, many hogs are killed, to save their value to their owners, and that the pork-eating inhabitants of our cities are, from time to time, solving the problem whether the flesh of diseased hogs is injurious to health.

I shall be glad to receive from any gentlemen, any accounts of this disease as it may be noticed by them, particularly in the country towns in this State.

# ENCOURAGEMENT OF THE PRODUCTION OF FLAX COTTON IN RHODE ISLAND.

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**From the Transactions of the Rhode Island Society for the Encouragement of Domestic Industry, for 1861.**

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At the meeting in April, the special committee on Flax culture made a report, which was taken up for consideration, and at the May meeting referred back to the committee, with instructions to report some premiums to be offered by the Society for the manufacture of Flax cotton. This committee made the following report, June 25th, which was received and adopted:

The committee of the Rhode Island Society for the Encouragement of Domestic Industry, upon the subject of Flax culture, having reconsidered their report on the subject made to the standing committee at the meeting on the 17th of April last, as per vote of the standing committee on the 15th of May last, report their recommendation of the following for the adoption of the standing committee:

*First.*—A premium of thirty dollars for a bale of not less than fifty pounds of the best prepared Flax cotton, with a statement of its culture, production and preparation, including the cost of the several processes.

*Second.*—A premium of twenty dollars for the second best bale of the same, upon the same conditions.

*Third.*—All necessary expenses of transportation and care upon these specimens to be paid by the Society, and after exhibition, the Society to retain the specimens if they choose, at a fair compensation for their value.

*Fourth.*—That the secretary of the Society be requested to take such measures as he may deem expedient for the promulgation of the above premiums.

Respectfully submitted, by

ELISHA DYER,
JAMES Y. SMITH,
B. E. EVANS,
WILLIAM VIALL,
ROBERT S. BURROUGH,
LYMAN B. FRIEZE,
*Committee.*

PROVIDENCE, June 25th, 1861.

Notice of these premiums was immediately published by the secretary in the newspapers in Providence, and slips containing the same were mailed to all persons supposed to be interested in the same.

On the 12th of July, a special meeting of the board was holden. The meeting was called by the President, pursuant to the by-law relating to special meetings, at the request of the members of the committee on Flax culture, who had signed the foregoing report. At that meeting, said committee presented the following report:

The undersigned, in behalf of the special committee on Flax culture, respectfully reports, that immediately subsequent to the last meeting of the standing committee, at which the report and premiums recommended by your committee for Flax cotton were presented and adopted, a special meeting of this committee was called at the request of one of its members, and held at the office of the chairman, on Friday, the 6th inst. At this meeting, a paper was presented containing subscriptions of more than five hundred dollars, from members of the Society and others, which sum has been placed at the disposal of the standing committee, for the purpose of increasing the premiums offered for Flax cotton. Your committee approving of this action, signed a call to the President of the Society, for a special meeting of the standing committee at the earliest opportunity, and they now offer for consideration and adoption the accompanying resolutions and subscriptions as previously referred to.

ELISHA DYER, Chairman.

PROVIDENCE, July 12, 1861.

The resolutions were as follows:

WHEREAS, since the meeting of this committee on the 25th day of June last, certain members of the Society, and other individuals, have placed a fund at the disposal of the Society, for the purpose of increasing the premiums voted that day to be offered for Flax cotton, it is therefore

*Resolved*, That this Society cordially accept the means so tendered, and for the purpose of carrying out the intentions of the donors, do now offer a further premium of $500 for the best bale of prepared Flax cotton of not less than fifty pounds, which shall be exhibited at the Society's exhibition at Providence, on the 11th day of September next.

The premium will be awarded only, upon the condition that the article is of a quality, and can be produced in quantity, and at a price, to be an economical substitute for cotton, all which must be proved to the satisfaction of the judges. The award will be made public on the third Wednesday in September, or as soon thereafter as the judges may be able to make their report.

*Resolved*, That the Secretary of the Society be requested to take such measures as he may deem expedient for the promulgation of the foregoing resolution.

The resolutions were adopted with unanimity and published as the preceding ones had been.

At an adjourned meeting in August, the special committee on Flax culture were authorized to appoint judges, on the specimens of Flax cotton that should be entered at the exhibition in September next, for premiums, and to award the premiums for the same; said judges to be selected from their own body, or from members of the Society, or from persons not members of the Society.

At the meeting on the 12th day of September, the special committee on Flax culture made the following

## REPORT:

That in accordance with the request from the judges upon the specimens of Flax cotton, offered in competion for the Society's premiums and herein inclosed, a meeting was held at the office of the chairman this day at 10 o'clock, and present Messrs. Smith, Burrough, Evans and Dyer.

It was unanimously *voted*, to request the standing committee to make the appropriation desired by the judges, and that request is now made.

The committee report as the judges upon Flax cotton,

Messrs. Robert S. Burrough,
Charles Jackson,
Stephen Waterman,
Albert Waterman,
Scott W. Mowry,
Zachariah Parker,
George Kilbun.

Respectfully submitted by

ELISHA DYER, Chairman.

Providence, September 16th, 1861.

The report of the judges above referred to was as follows:

To the Committee on Flax Culture:

The judges to award the premiums offered by the Society, for Flax cotton, having given the subject attention, are of opinion, that the samples on exhibition and the explanations of the exhibiters, render it desirable, on the part of the judges, to test the product practically on cotton machinery. They are happy to say that some of their members are willing to furnish the necessary machinery, if stock in sufficient quantity can be had. They, therefore, respectfully ask the committee to request from the standing committee of the Society, an appropriation of one hundred dollars, to be expended by them, the judges, in the purchase of stock for this purpose.

CHARLES JACKSON,
ZACHARIAH PARKER. } For the judges.

After consideration, the board passed the following resolution:

*Voted*, That the said sum of one hundred dollars be appropriated for the purpose of purchasing Flax cotton to be experimented with by said judges, (the product to be the property of the Society) and be paid out of the treasury to said committee.

At the stated meeting of the board in November, the committee on Flax culture made another report, inclosing the report and award of the judges. This may be found on page 349.

The subject is still before this committee. It is one of the greatest importance, and exciting a great deal of interest at the present time, among farmers as well as manufacturers. The soil of Rhode Island is known to be fitted for the production of Flax. It was made to produce enough for the supply of many families, especially with coarser cloths for constant use, before the introduction of cheaper fabrics of cotton by machinery. A large amount of linen and tow goods is still in use in the State, procured by importation. Shall the farmer be advised to resume here the cultivation of Flax? It is idle to hope that the manufacture of it in the family will be resumed. Will capitalists take the crop of the farmer at remunerating prices, and manufacture it into fabrics, to supersede the linen fabrics, now imported? It is said that the cost of the machinery and the high price of labor forbid the hope of this result at present. Capital seeks remuneration and increase, but is doubtful of either if employed in this direction. Can Flax be cottonized, the length of its staple reduced, and the fibre rendered so fine, as to be used on cotton machinery as an economical substitute for cotton? This question has engaged the attention of many of the best minds in Europe and America, for many years. The facility and cheapness with which cotton could be procured has hitherto weakened the efforts to decide this question. Whenever any circumstance has occurred to render doubtful the supply of cotton for the mills erected for its manufacture, the manufacturer has looked toward Flax cotton, and ingenious and scientific men have been called upon to exert their energies for its production. As soon as such circumstances have been removed, the manufacturer loses all solicitude on the subject, and the ingenious men engaged in the investigation are left to their own resources to pursue their inquiries, which, if successful, they could have little hopes of having introduced into use to their profit. The attention paid to this subject has therefore never been steady, with a resolution to solve the question proposed, but spasmodic in its exertions, regulated by other causes. There have been some exceptions. Individuals, ingenious and scientific, and almost, of course, without spare means, have always since the question was first broached, been toiling over it. According to the report of the judges to the Flax committee their efforts have been partially successful. A lint has been obtained which can take the place of cotton in fabrics of mingled wool and cotton, with advantage. Confessedly stronger than cotton, taking and holding colors better than cotton, and capable of being produced as cheap as cotton in a much larger extent of our country, there seems to be no reason why it should not for this purpose supersede the use of cotton. But these judges go further in their report. They imply a hope, and almost the belief, that Flax cotton can be made an economical substitute for cotton, on cotton machinery, in the ordinary fabrics made of that material. That such men as these judges are, entertain such a hope, is it not expedient that they should be induced to go on with experiments and settle the vexed question. They are men practically acquainted with machinery, with cotton and with the manufacture of cotton—men who commenced their examination of the subject with serious doubts whether any thing could be done with cottonized Flax. Their doubts, it would seem, are shaken, and further experiments will show their hopes illusory or change them into certainty. In either case advantages would result from them. If successful, the advantages are apparent—if unsuccessful, the ingenuity of other minds will be profited by their labors, and induced to make stronger efforts for success, or satisfied by the result, will turn into other channels.

*To the Standing Committee of the Rhode Island Society for the Encouragement of Domestic Industry.*

The undersigned, the committee on Flax Culture,

### REPORT:

That at the meeting of the standing committee, on the 25th of June last, a first premium of thirty dollars, and a second of twenty, was offered for the best, and second best bales of not less than fifty pounds of the best prepared Flax Cotton, fit for use on cotton machinery, accompanied with a statement of its culture, production and preparation, including cost of the various processes.

At the meeting of the committee on the 12th of July last, "the further premium of five hundred dollars, for the best bale of prepared Flax Cotton of not less than fifty pounds, without respect to the place of its manufacture or production, which shall be exhibited at the Society's Exhibition in Providence, on the 11th day of September next," was offered.

In response to this action of the standing committee, there was exhibited at the recent exhibition of the Society (on the 11th of September last), by Stephen Randall, of Warwick, R. I.,

One bale of 51 pounds of Flax Cotton, marked A 1.
One bale of 54 pounds of Flax Cotton, marked A 2.
Fifteen different samples colored Flax for wool.
One sample of White Flax for wool.
Seven samples of Flax Cotton.
Three samples of Flax and cotton (one half each).
Five samples of yarn (Flax and Flax cotton).
Four samples of cloth.
Two samples of colored Flax Cotton.
Five other samples of colored Flax Cotton.
Three samples from drawing frame (in process of manufacture).
One piece of pantaloon stuff (30 per cent. Flax).
One piece of 37 inch sheeting (25 per cent. Flax).
One piece of prints (25 per cent. Flax).
Two lap rolls of Flax Cotton (in process of manufacturing), and a model Flax brake.

Hall & Farrar, of Jamaica Plains, Mass., exhibited one box of 53 pounds of Flax Cotton.

One bale of fine Flax wool, 36 pounds, and one bale of coarse Flax wool, 36 pounds.

By James Anderson, Louisville, Kentucky—

Two boxes carded Flax wool.

Samples of flyings from carding machines, and a sample of rotted hemp.

From Jonathan Knowles, of Providence, R. I.—

One bale of 52 pounds of Flax cotton,

By James C. Butterworth, of Providence, R. I.—

One bale of 10 pounds of Flax cotton, manufactured in June, 1858.

By authority of the standing committee, at their meeting on the 21st day of August last, the following persons were appointed judges for the examination of such specimens as might be offered for exhibition or competition, and to award the premiums, if merited, viz: Messrs. Charles Jackson, Zachariah Parker, George Kilburn, Scott W. Mowry, Albert Waterman, Stephen Waterman and Robert S. Borrough, all of Providence, except Mr. Kilburn, who is from Lonsdale, R. I. It will be observed that all these gentlemen are well acquainted with cotton as an article of extensive consumption, and with but two exceptions, are practical manufacturers.

On the 22d of this present month (October), the accompanying report from these gentlemen was received and is commended to the especial attention of the standing committee. A reference to it shows that no premiums are awarded That the interest felt by them in this very important subject, has led them, not only critically to examine the specimens submitted to their attention, but to make investigations involving much time and labor; and the result of which justifies the assertion, "that the encouragements for ultimate success, are too strong to allow the investigations to rest here." They thus transfer (if not create) to the Society, a responsibility in this subject, which has not heretofore been so strongly expressed.

Your committee held a meeting at the office of the chairman, on the morning of the 29th inst., at which Messrs. Harris, Burrough, Evans, Viall and Dyer were present.

The report from the judges was read, received, and discussed. It was then *voted*, that the judges be requested to continue their labors and investigations until a satisfactory result of the practicability of Flax cotton as a fibre for manufacturing purposes is obtained, or its impracticability proved. *Voted*, that the chairman appoint a committee to raise such funds as may be required for the contemplated action of the judges. In conformity with these votes, notice was promptly sent to each of the gentlemen referred to, and all the members of this committee were assigned to the duty of providing the necessary means.

Your committee are very desirous of an early answer from the judges to the many inquiries that are made of their progress; not only by manufacturers, but by agriculturists, as to the expediency of directing more attention to the cultivation of Flax, as a remunerative product. With the attention already given by the judges in their department, and the proper action by the individual members of this committee, this desire may be early gratified.

Respectfully submitted,

For the "committee on Flax Culture," &c.,

ELISHA DYER, Chairman.

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*To the Committee on Flax Culture of the Rhode Island Society for the Encouragement of Domestic Industry:*

The undersigned committee, appointed to examine the Flax Cotton offered for premium, at the Fair held in this city on the 11th day of September last—

Respectfully represent, that they have carefully inspected all the samples that were contributed on that occasion, and having in view the terms upon which the premiums were offered, viz., "Fit for use on cotton machinery," and "accompanied with a statement of its culture, production and preparation, including the cost of the various processes," they are of opinion that none of the contributors are entitled to the premiums so offered.

It is, however, due to the enterprising gentlemen who represented Mr. Stephen Randall's process for breaking flax, to say, that flax as prepared by them for working with wool, is, in the judgment of the committee, much more valuable than cotton, in all fabrics in which cotton is now mixed with wool; and in some kinds of goods, appears to be desirable as a partial substitute for wool itself.

Feeling a warm interest in the substitution of flax for cotton, they have investigated the subject more thoroughly than was required simply to discharge the duties for which they were selected; and are led to believe, that the encouragements for ultimate success, are too strong to allow the investigation to rest here. Therefore, they hope that the Society will devise some plan whereby this investigation may be continued until the question, whether or not flax can be used as an economical substitute for cotton, on cotton machinery, is *practically settled.*

Charles Jackson,
Zachariah Parker,
George Kilburn,
S. W. Mowry,
Albert Waterman,
Stephen Waterman,
Rob't S. Burrough.

Providence, Oct. 22, 1861.

# SOME FACTS AND REMARKS ON THE INDIGESTIBILITY OF FOOD.

BY J. H. SALISBURY, M.D.

Digestion is a process by which alimentary substances when introduced into the digestive canal are converted into two parts : the one nutritious, to be appropriated to nourishing and building up the tissues of the body and supplying it with matter to take the place of the constantly wearing out materials ; the other non-nutritious, to be cast off.

Digestion consists of an interesting series of organic actions. 1. Introduction of the food into the mouth. 2. Masticating and incorporating it with saliva. 3. Swallowing. 4. Muscular action of the stomach upon it, and the solvent and chemical action of its secretions. 5. Muscular action of the small intestines upon it, and the chemical action of their secretions and those of the liver. 6. Muscular action of the large intestines upon it, and its expulsion as fæces.

When digestion is healthy and perfect, the fæces consists of a fine, homogenious, pulpy mass, exhibiting no appearance in common with the food eaten ; but when it is not, then in the fecal matter are distinguished evident traces of the alimentary materials.

Indigestibility arises from two causes : First, derangement of the digestive apparatus ; Second, the indigestibility of the food. The first originates either from a functional or organic disease, of which, it is not our intention now to speak ; the second depends entirely upon the quality, condition and composition of the alimentary materials, as we shall now attempt to show by some familiar examples.

All food is not equally digestible, and in some cases, that which is considered the most nutritious, is really the most rebellious. Cheese, fat, cucumbers, water-melons, cherries, green apples, green corn, etc. when taken alone, on an empty stomach, are substances almost sure to pass through the intestinal canal imperfectly digested, causing uneasiness, cholicy pains, and often cholera morbus. The indigestibility of the cucumber is almost proverbial ; in fact, it has scarcely a parallel among all the cultivated edible plants. In studying its composition, we can scarcely refrain from making the inquiry, what does this fruit contain to unfit it so much for easy digestion ? In attempting to answer this question we will bring to our aid its composition.

### *Percentage of Water, Organic and Inorganic Matter.*

| | Cucumbers. |
|---|---|
| Percentage of water | 95.424 |
| Percentage of organic matter | 4.288 |
| Percentage of inorganic matter | .288 |

### *Amount of the several Inorganic and Proximate Organic bodies in 1.000 lbs. of fresh Cucumbers.*

| | Cucumbers. |
|---|---|
| Phosphoric acid | .6094 |
| Per-oxide of iron | .0242 |
| Potassa | .6794 |
| Soda | .9749 |
| Magnesia | .0052 |
| Lime | .1239 |
| Sulphuric acid | .0263 |
| Carbonic acid | .3846 |
| Chlorine | .0318 |
| Silicic acid | .0202 |
| Amount of inorganic bodies in 1,000 lbs of fresh cucumbers | 2.28 lbs. |
| Starch | .02 |
| Albumen | 3.32 |
| Casein | .36 |
| Dextrine | 3 30 |
| Sugar | 26.56 |
| Cellulose and Lignin | 8 99 |
| Coloring matter | .06 |
| Wax | .27 |
| Amount of organic in 1,000 lbs. fresh cucumbers | 42 88 lbs. |
| Amount of water in 1,000 lbs. of fresh cucumbers | 954.24 lbs. |
| Total | 1,000 lbs. |

We see here a remarkable instance of the extent to which water may enter into the composition of a solid vegetable substance. 100 lbs. of the fresh fruit contains about 95½ lbs. of pure water, and only 4½ lbs. of dry matter. Consequently one ton would contain but about 90 lbs. of dry matter.

The inorganic matter is composed mostly of phosphoric acid, potassa and soda.

One would naturally suppose, from the tendency this fruit has to pass through the digestive apparatus, without being materially acted upon, that it might be constituted of bodies that are either deliterious to the system, or are not essential to its composition. If we refer to the analysis, however, we find that the ingredients which enter into its composition, are found in other food which is nutritious and easy of digestion; in fact, the most of them go to build up and support the several tissues of the human body, and are necessary to their healthy nutrition and growth. Hence we must conclude that the indigestibility of this fruit cannot depend upon the kind of ingredients of which it is composed. Is there not something in the relative proportion of the materials which compose it, that may throw light upon the subject? We find in the foregoing analysis all the bodies in very small proportion, with the single exception of water. The percentage of this in the fresh fruit exceeds 95 per cent. May we not infer that this large percentage of water has something to do in retarding digestion? It is well known that all of those fruits which contain a very large percentage of water, (equal or nearly so to that of the cucumber,) such as water-melons, green apples, cherries, green currants, green corn, etc., are very apt, when taken in quantities and unmixed with other more solid food, and on an empty stomach, to produce like unpleasant symptoms and derangement, and pass through the stomach and intestines, but imperfectly acted upon by the solvents of these organs. Water, however, is not the only body, which, when in great excess in food, appears to increase its indigestibility. Other substances, as fat, casein, albumen, etc., when in large proportion, produce like results.

For instance, a healthy person makes out a hearty meal from fat, without the admixture of other food. Under ordinary circumstances, he would experience the symptoms previously mentioned and much of the fat would be voided in the same condition in which it was taken into the system. The same is the case with cheese (which is nearly pure casein—mixed with most of the constituents of the animal body in small proportion) when eaten alone, and to excess it will be often voided in a similar undigested state. May not this condition of things always have a tendency to accompany all food composed principally of one ingredient of the animal body, with the others in minute proportion? Is it not true that food suited to easy and healthy digestion, should contain not only the ingredients which enter into the composition of the body, but those ingredients should be present in some simple relative proportion to each other, which should be similar to that of the matter which is already fitted to nourish the several tissues in a healthy manner? That is, the ingredients of the food should be in such proportion, as is best suited to furnish nourishment to the system with the least possible loss of undigested material.

# NITROGEN COSTS LESS THAN ONE CENT A POUND.

All who are in favor of agricultural progress, certainly will fully indorse the opinion of Stoeckhardt, namely, that a farmer who buys guano, bone-dust, or any other artificial manure, without taking good care of his stable-manure, is an extravagant husbandman; for he hauls, at a heavy expense, the same thing into his yard, which he might have had for nothing, if he did not suffer it to flow away or evaporate, without making use of it.

Likewise that farmer who does not carefully accumulate and conserve the excrements of his household and stock, acts like an inexperienced miner who throws away rich silver ore because it does not shine like glittering silver.

Acting upon this principle, v. Fellenberg, for several years past, has thoroughly studied the management and conservation of barn-yard manure, at his manor of Wegmuehle, near Berne, and, by the following statement of his experience, has furnished very valuable additional proof that as nitrogen is the most powerful agent, and therefore the most valuable constituent in the preparation of barn-yard manure, the chief object of a thinking and calculating farmer ought to be the conservation of the nitrogen, by most effectually preventing fermentation and decomposition, and by retaining the productions of the same.

As early as in the winter of 1853, letters were written on this subject by him to a friend, showing that, in preparing barn-yard manure, pulverized plaster will accomplish all that may be expected from such a conservative procedure, namely, sure and complete efficiency, easy application, and cheapness of the matter applied.

A correct and successful preparation of manure, of course requires a normally-prepared manure-heap; but this is not the place for a detailed description of a model dung-heap; yet it may be instructive to become acquainted with the careful and accurate management of manure in the canton of Berne.

The following extracts are from v. Fellenberg's letters to his friend:

The dung of my cattle is brought out of the stable upon the manure heap every day. As I feed abundantly, strew copiously, and have the litter turned and smoothed several times in the course of the day, it is completely moistened by the excrements and urine; and a proportionately *large* quantity of manure is made every day.

In carrying out the manure, layers or so called twists are made of the longest straw, by means of a small board: this straw is laid lengthwise upon a little board with the fork, about 3 inches thick, and trodden down with the feet. Then it is laid together in the middle, again trodden down, and put at the edge of the manure-pile, where it is again tramped down. Thus layer upon layer is laid close and flat beside each other. The remaining dung is now carefully spread with the fork, and laid along the edge of the manure-layers, to an equal height with them, and as smoothly as possible, so that there are nowhere any elevations.

Then the manure is tramped down everywhere. After this, from 2 to 2½ lbs. of common plaster is strewed evenly upon 100 lbs. of fresh manure.

This quantity of plaster might appear too large, and half as much be deemed sufficient, to fix the ammonia contained in the dung; but even a superficial calculation will show that it is not so.

The general estimate of chemists is that 2½ parts of anhydrous sulphuric acid are required to fix 1 part of ammonia.

According to Boussingault, manure in the condition in which it is usually hauled upon the field, contains about ½ of one per cent. of nitrogen, or ½ lb. in 100 lbs. If the same is calculated as ammonia, it will be a little more, about 0.6 to 0.7 lb. But as all the nitrogen contained in manure is not in the form of ammonia, but a portion of it yet in organic combination, as in the straw and the undigested remains of food, I estimate the amount of ammonia contained in 100 lbs. of manure only at 0.4 lb. These require about 1 lb..of sulphuric acid to be transformed into sulphate of ammonia.

In 2 to 2½ lbs. of half-burnt plaster—which then is air-dry—there is contained about 1 to 1¼ lbs. of pure anhydrous sulphuric acid. From this it will be evident that too little rather than too much plaster has been strewed, to fix the ammonia, since it is estimated that only ½ to ⅝ lb. of the ammonia contained in the plaster, or in 2 lbs., instead of 1 to 1¼ lbs., will be efficient. As yet, there is no reason for augmenting the amount of plaster, as no evaporation of ammonia was perceptible,—and thus the object intended was accomplished.

But the nitrogenous matter, in the form of ammonia, contained in the manure, may not be as considerable as estimated, so that the amount of plaster used is, in any event, sufficient to fix the same.

It is to be regretted that, up to the present time, it could not be ascertained by analysis how much of free ammonia and how much of nitrogen combines with the organic substances which are contained in barn-yard manure. But as, according to Stceckhardt's accurate investigations, 1 lb. of plaster is equal to about 1 cent's worth of manure, more may be strewed on without being extravagant; this being the price of plaster, is more than returned by its value as a manure.

The above-described preparation of manure, perhaps, may appear to be too minute and particular, especially to individuals who think everything may be accomplished by talking and writing, and who do not consider or know that in agriculture, as well as in all other branches of industry, the details, apparently of very little moment, are often of the greatest importance, and that it is not enough that a thing *is* done, but chiefly *how* it is done.

All the manipulations mentioned above, generally practiced in the canton of Berne, the home of proud and generous dung-heaps, are adhered to for the best of reasons established among the practical farmers, by long experience, beyond the possibility of any doubt.

The air is known to cause, or at least to promote, all organic decomposition; everything, therefore, which is to be saved from decomposition or putrefaction, must be excluded from the air. This is the object of all these manipulations.

The structure of solid layers, which are closely and conjointly laid upon each other, is calculated to prevent the access of air. As there is, in most localities, no preparation for the accumulation of manure-heaps within a wall of brick or wood, in order to preclude the access of air, then this wall or fence is simply and cheaply constructed of the manure itself.

Further, these manure-layers have the advantage of preventing the flowing off of the liquid manure, thus keeping the dung moister, because the ends of the straw are all turned inside.

The tramping down of the dung laid in regular strata is done not only to prevent the access of air from without, but more especially to expel the air already contained in the manure, and thereby to remove the cause of putrefaction as perfectly as possible.

All these manipulations evidently tend to prevent or arrest decomposition; yet they cannot prevent the dung from growing hot, or fermenting, and, in consequence, the ammonia evaporates from it, and its most valuable constituent part escapes.

To prevent or fix the ammonia, is the problem for the thinking and calculating husbandman. But this end may best be accomplished by certain quantities of plaster being strewed on, because the sulphuric acid contained in it combines with the ammonia to form *sulphate of ammonia*—a salt which will not volatilize in ordinary temperatures, but remain in the manure.

But why nothing but plaster? Why not muck, or common earth, or ashes, or sulphuric acid, or sulphate of iron?

The reason must be obvious to everybody.

The greatest merit of every technical enterprise is *to accomplish much with small means*.

In the majority of cases, plaster is the cheapest binding or fixing agent, and is the most universally abundant.

But the farmer has to buy the plaster, and every farmer has muck, or earth, or at least common earth on his farm, which he might use for this purpose. For nothing? What a gross mistake! Who then pays for the team and manual labor, the digging, loading and unloading, hauling and spreading of these earthy substances upon the manure-heap? Certainly, nobody else but the non-calculating farmer.

Further, we have to consider that all this earth turned into manure is again to be loaded, unloaded and spread. What a miscalculation!

V. Fellenberg made and brought upon his fields 300 wagon-loads of manure, within the last year. He writes:

"If I had, in preparing my barn-yard manure, spread strata of earth between the layers of manure, instead of using twenty barrels of plaster at 7 cwt., 140 centimetres worth 140 francs, = 37 thalers 10 sgr., I would have needed at least a wagon load of earth to each wagon load of manure, in order to let *no* ammonia escape."

This estimate might seem too high; therefore, let us consider it. An ordinary two horse load of earth contains 24 to 28 cubic feet, a wagon load of manure 36 to 40 cubic feet; thus, there would be about three-fourths of a cubic foot of earth to every cubic foot of manure. Now, as all earthy matter retains gases *mechanically* only, but cannot bind or fix them *chemically*, a very considerable quantity of earthy matter, indeed, is required to accomplish the same end; besides, many kinds of earth contain considerable quantities of carbonate of lime, which is much more apt to expel the ammonia than to retain it.

Moreover, Payen's experiments show that earth, peat-coal, muck, sand, etc., mixed with an equal weight of manure, were unable to retain the whole amount of ammonia contained in it, but retained 60 to 70 per cent. only of the original amount. On the other hand, he found that five parts of unburnt plaster, upon one hundred parts of fresh stable manure, are sufficient to fix *all* the nitrogen contained therein.

Now, as one cubic foot of loose earth weighs from seventy to eighty pounds, and one cubic foot of manure from fifty to sixty pounds, and, consequently, in the proportion of three-fourth cubic feet of earth to one cubic foot of manure, from fifty-two to sixty pounds of earth are required upon it, it is evident that the above estimate is not too high, but should rather be increased than diminished, in order to answer the purpose of completely conserving the ammonia in the manure.

But burnt plaster is more conducive to disinfection, since it is sooner decomposed than unburnt plaster, because the crystalizable matter contained in the latter retards decomposition. Therefore, if slightly burnt plaster may be had, it is preferable to unburnt, because there is less of the former required, and it operates sooner. Yet much depends on the price of plaster.

To return to the foregoing instance; to the three hundred wagon loads of manure, three hundred loads of earth would be required. But these three hundred loads of earth must be dug, loaded and hauled. Three hundred loads hauled in and six hundred loads hauled out make nine hundred loads; thus six hundred loads of manure more were to load and haul than when plaster is used.

If the fields are near at hand, and the laborers good workers, the hauling out of these six hundred loads of manure requires at least thirty days of time for one team, one driver and two laborers for loading. If wages are low, and the tear and wear of the utensils are not taken into account, the expense for thirty work-days, for

| | | |
|---|---|---|
| One two horse team, would be | 112½ francs. | 30 thalers. |
| Ninety days' wages, (for three laborers,) | 150 " | 40 " |
| Total | 262½ " | 70 " |

While the plaster used costs only 140 francs, 37½ thalers, or 122½ francs, 32½ thalers less than the earth used for this purpose.

Thus it is evident that it would be much dearer to use earth instead of plaster, and, besides, it would be very difficult to find a sufficient quantity of the proper earth close at hand, and to have all this labor and hauling done with the team and laborers, at ones command, and without neglecting or postponing other work.

The foregoing figures also answer the question, whether it is *practical* to strew earth in the stables instead of straw.

Thus it is with many well-meant advices to agriculturists. If we take our pencil in hand and make calculations, we will find that many brilliant suggestions prove to be impracticable. Finally, says N. V. Schwerz, in his "*Practical Agriculture,*" in regard to strewing earth in stables for cattle, "any agricultural procedure is commendable, only when the expenses and labor connected therewith are in just proportion to the profits realized therefrom."

The same holds good in regard to the preparation of manure with earthy matter.

Peat or peat-ashes might be used, because it would require a less quantity of the same than of common earth, and because there is more fertilizing matter in them; but the question is whether these substances are to be had near at hand. In the majority of cases plaster will cost less.

Sulphuric acid and sulphate of iron are, at all events, dearer and more difficult to apply than plaster, especially the former. Neither of them can be used except in a state of solution, which is an additional labor. Every one who knows the advantages of being able to simplify all labor on farms, and to save as much labor as possible, will, for this reason alone, prefer the use of plaster.

A hundred weight of common plaster, unburnt or only half burnt, estimated at one franc, contains forty-six pounds of sulphuric acid; so that one pound of it, if the lime of the plaster is not taken into consideration, will cost about $\frac{2}{100}$ francs, two pennies, while the wholesale price of sulphuric acid is from five to six cents.

Although it must be admitted that not all the sulphuric acid of the plaster takes effect in the manure, yet it is estimated that at least half of it combines with the ammonia. Even then it will still be cheaper.

Plaster is easily applied by hand, and required, at most, five minutes daily. There is no danger or inconvenience connected with its application; and its quantity adds but very little to the mass of the manure, so that the expense of hauling out the manure is not much increased thereby.

If the manure is prepared in the above described manner, strewed with plaster, and, during the dry season, now and then wetted with the liquid manure flowing off, it will be observed that the manure-heap increases much more rapidly than before, and that, all other circumstances (stock feeding and strewing) being equal, there will be much more manure made than otherwise.

Manure thus prepared with plaster, and having lain a whole year uncovered in the free air, was found to be entirely undecomposed when hauled upon the field, and had retained its original greenish color and characteristic tenacity. The manure-heaps being left untouched, and having a hight of six feet, had settled about two inches only during the year, and this more by its weight than by decomposition.

Plaster manure has a strong smell of sulphureted hydrogen gas. There was not the least odor of ammonia to this.

If the large quantity of ammonia evaporating from a single manure-heap, within a year, is taken into consideration, it is evidently very profitable to conserve the same at so trifling expense.

V. Fellenberg's stock consisted of fourteen cows and six horses. He used 140 cwt. of plaster.

If only half of the sulphuric acid contained therein is estimated as sulphate of ammonia, it is easily found out how much nitrogen has been bought with 140 francs,—and is surely cheaper than by buying guano, Chili saltpetre, phosphate of lime, fish guano, etc.

If in the 140 cwt. of plaster only half of the sulphuric acid contained therein, or about 32 to 34 cwt., take effect, then these are able to fix chemically about 15 cwt. of ammonia, or, reduced to equivalents, is equal to 1300 pounds of nitrogen.

Nesbit, the chemical chaplain of Great Britain, says in an address before the Farmers' Club, "If you are compelled to buy ammonia in market, you have to pay fifty pound sterling per ton, or one shilling per pound; and you have to pay the same price for it in any kind of manure containing it. If you will buy phosphates or any other matter of that kind, you have to pay a very high price; therefore, you ought to take the greatest care to prevent such a waste."

Stoeckhardt estimates the worth of a pound of nitrogen at one franc; but by the above-stated preparation of the manure the pound of nitrogen costs only about 10¾ switzer rappen, about two cents, only the ninth part of the price or worth fixed by Stoeckhardt.

Further, it is estimated that, by the general preparation of manure, at least the one-fourth part of its nitrogenous matter is lost.

That portion of the nitrogen retained in common manure, even if it lies a long time, of course, is conserved also in the plastered manure. Thus it may be justly asserted that the above quantity of ammonia or nitrogen is a *net gain*.

In the above-mentioned case there were made three hundred wagon loads of manure of thirty-six cubic feet, ten thousand eight hundred cubic feet, five thousand four hundred weight.

If it had not been plastered its nitrogenous matter might be estimated at about one-half of one per cent., or 2,700 cwt., instead of 5,400 cwt.

Further, if we estimate the nitrogenous matter of the plastered manure to amount only to three-fourths of one per cent., then the above 5,400 cwt. would contain 4000 pounds of nitrogen, i. e., exactly 1300 more, or as much, as has been fixed by the 140 cwt. of plaster applied.

The increase of nitrogenous matter in manure by one-fourth of one per cent. surely will not appear strange, if we consider that Boussingault (*Economie Rurale*) shows that dung kept under the cattle in the stable contains 0.79 per cent. of nitrogen, or one-fourth of one per cent. more than manure lying in the open air; while the same author states, from different analyses, showing that manure prepared in the common way contains from 0.41 to 0.60 per cent of nitrogen.

Way, Voelcker, Hoffmann, Johnson, Wolf, Henneberg and others found similar results, and, thus, it is evidently unwise to procure nitrogenous manure from abroad at enormous expense, and to lose the nitrogen produced at home, which might be saved with little labor and at a trifling expense.

Thirteen hundred pounds of nitrogen are bought with 140 francs paid for the plaster, while Stoeckhardt estimates its worth at 1300 francs.

But this is not all!

Any farmer, who is not blind, knows that every manure-heap, lying for some length of time, will commence to ferment, become heated, and, consequently, settle considerably. But how great the loss may be, if large manure-heaps are left lying for a long time, especially in the warm season, has been shown in a German agricultural journal, in an instance which occurred in the year 1863, which was a very warm one.

The horse-dung of the Electoral stud of Hesse, at Beberbeck, is used upon the cultivated portion of the stud-fields; but cannot be hauled out in summer or early in the fall.

The dung-heap is not much exposed to the winds and the sun. Of the two hundred and fifty loads of dung, accumulated from the beginning of June, at the beginning of November there could not be hauled off more than one hundred and forty-eight loads, although the dung-heap had often been overspread with earth, and tramped down every now and then;—thus, more than two-fifths of the whole mass was lost.

The manure heap selected by V. Fellenberg for his experiment, measured, at the beginning of summer, 35 feet in length, 27 feet in width, and 6 feet in height. The decrease in height, by autumn, amounted to 2 inches; width and length remaining the same.

Without plaster, the fermentation would have caused a decrease of at least 7 inches, or 5 inches more than it really did, according to comparative experiments.

These 5 inches of less decrease in height are attributable to the operation of the plaster preventing the fermentation of the manure.

These 5 inches calculated over the whole heap make an amount of 472½ cubic feet, or over 2 cubic cords, or about ten to twelve two-horse loads. As during the winter months only half of the plaster requisite for the year was used, or 70 cwt., it appears that, at an expense of 70 francs, there were produced 2 cubic cords of manure of 216 cubic feet—108 cwt. more—with nitrogenous matter, amounting to ½ of one per cent., 54 lbs. of nitrogen, at 1 franc per lb., or 54 francs; or with 70 francs, 108 francs worth of manure. At Swiss prices, 1 cubic cord of cattle or mixed manure costs 40 to 60 francs; thus its fixed price is proportionate to its intrinsic worth, since, by the application of plaster, there was produced an augmentation of manure corresponding and actually to be estimated equal to the purchase or addition of 2 cubic cords of manure.

Now, if the additional nitrogen contained in the other portion of the dung is yet taken into consideration, or for 70 cwt. of plaster about 650 lbs. of nitrogen, then there is bought, at an expense of 70 francs, including the above 108 francs, a total worth of 758 francs of manure; or in other words, with 70 francs there is bought a thing worth 758 francs.

If we calculate yet more minutely, these 758 francs are a *net gain;* for, according to Stoeckhardt, 1 lb. of plaster, as such, is one pennyworth of manure, and the lime of the same, after the sulphuric acid having been combined with the ammonia has escaped from the soil, will, according to the law of chemical affinity, combine again with the same (sulphuric acid) into plaster, its peculiar worth as manure is conserved, because its entire worth as a fertilizer benefits the field.

If the same augmentation of manure, during the winter, by the strewing on of plaster, also holds good in regard to the manure made during the summer, then the quantity of manure thus added or gained yearly, amounts to over 4 cubic cords, worth 200 francs. Thus the plaster pays for itself nearly 1½ times, merely by this augmentation of the quantity of manure, without taking into consideration the gain of 1,300 lbs. of nitrogen.

To resume, the operation of the plaster is a threefold one.

1. As conservator of the nitrogen, which would have been lost without the application of plaster, and as such, it is worth, at least, nine and a half times its own price.

2. As a preventive of fermentation in the manure and its consequent decrease, and thus, as indirect augmenter of the same, to a value of one and a half times its own cost.

3. Directly as fertilizer, worth its own cost.

Altogether, worth twelve and a half times its own cost.

Could the farmer incur any expense which may prove as profitable as this, for the conservation of the self-made and indispensable nitrogen?

Suppose that the guano accessible to us contains, on an average, only 10 per cent. of nitrogen, and that about 130 cwt. of guano were to be bought and used as manure. At the Swiss price of guano, 20 francs, those 130 cwt. would cost 2,730 francs. Thus the amount of nitrogen which might be had at an expense of 140 francs for plaster, will cost about twenty times as much, if guano is used.

Further, suppose that in guano, on account of its quick operation, 1 lb. of nitrogen is worth as much as 2 lbs. of nitrogen in the slowly operating barn-yard manure—and we endeavor to make the capital invested in manure pay interest as soon as possible—then the nitrogen obtained in barn-yard manure will cost only one-tenth as much as in guano; or, if there are 20 per cent. of nitrogen in guano, then the cost by using plaster will be only one-fifth.

If the expense incurred for plaster should not be returned at the above-stated ratio in the first year, it will, surely, in the course of time. The farmer must make advance investments in the soil more or less for a long term; but they will certainly bear usurious interests, if they are judiciously made, for the soil is no spendthrift, but a prudent, economical husbandman and debtor, hard to be made bankrupt.

Now let us consider the effect of this preparation of manure.

1. The manure is not subject to any decomposition in the heap, and, consequently, its original volume remains the same, no matter whether it lies but a few weeks or for some length of time, before it is used. It is an advantage to be able to keep the manure, without any considerable loss, until there is ample time for hauling it off; and this is a matter of great importance in many cases, because the farmer is much more independent in respect to the rotation of his crops and in the arrangement of the labor to be performed.

2. As the manure remains wholly undecomposed, it comes into the soil, and is decomposed, like fresh manure from the stable, whereby the putrefactive productions of its carbonic acid and ammonia gases are wholly made to benefit the soil, being retained by it.

Although we deem it an evidence of honorable industry in a farmer when he puts his manure into the soil as soon as possible, yet there are seasons and circumstances compelling him to let his manure lie for a longer period of time, and sometimes in a high temperature of the air; then the application of plaster certainly is of great importance, especially for such kinds of soil as require fresh manure, on account of their porosity.

3. It is a fact, confirmed by long experience, that plastered manure operates much better upon hot and calcareous kinds of soil, because it is slowly decomposed, and thus will endure longer; besides, there may be put at once a much larger quantity of plastered manure into the soil, without apprehending that the next succeeding crops might be injured by the excess.

Manure which had been plowed under in a hot soil, in the last year, was found to be almost entirely unchanged at the second plowing—nearly like unplastered manure—after having lain half a year; while unplastered manure had completely disappeared out of the soil, after the first crop had been gathered.

4. The richness of the plastered manure in nitrogen is shown not only by chemical analysis—for this might deceive—but especially by the extraordinarily luxuriant vegetation of all crops first raised upon it.

Before proceeding to prove this assertion of v. Fellenberg, by facts, I may be permitted to state some other facts.

From the fall of 1848 to April of 1855, the Principal at the Agricultural School at Beberbeck, an electoral domain of Hesse, it being also a stud establishment, and, during the frequent long absence of the Director, the justiciary, Urichs, the Principal, served in the capacity of superintendent of the establishment.

All the lands of this domain, amounting to about 1,000 acres, are situate in the region of variegated sand-stone. This elevated region extends in undulating ridges over the whole Reihard's Forest. Corresponding to the general character of this hilly region, the arable soil is a sandy loam, nearly free of stone, and destitute of lime. The chemical condition of the soil is nearly everywhere equal, and varies only in respect to the humus, according as the fields have been cultivated earlier or later and been manured more copiously or sparingly, or have been more or less exhausted.

The depth of the arable soil now measures from 5 to 10 inches; but before the present lease it averaged not over 4 inches. In the newly turned up fields at the south-southwest line of the domain, the so-called swamp-ore, hydrate of iron, is found here and there in the soil, and still more in the deeper strata.

The condition of the subsoil partly is very similar to that of the upper crust, and differs from it only by being more compact and retaining more water; but partly, also, from an argillaceous, rolling or solid stratum of sandstone, and even here and there a substratum of real potter's clay, which lies so close to the arable portion, that, on that account, a considerable portion of the fields have an impermeable subsoil, and, before Mr. Urichs took the management of the domain, in 1845, was so wet, cold, sour and full of weeds, that red clover grew very scantily upon 300 acres of the arable land; the turnip-crops, without previous artificial mineral manuring, failed regularly; on the other fields, rye and oats were unsafe crops, and beans, peas and vetches, white clover and grass crops could not be raised at all, without liming.

It was evident that this domain so shamefully neglected required, beside an intelligent and energetic cultivation, especially to be deoxydized, cleansed of the weeds, and highly manured.

And the work was undertaken in earnest: the fields were thoroughly cleansed of all root and seed weeds in the beginning, by making narrow beds; the subsoil was drained, and various organic and inorganic manures, paying for themselves, were purchased; the arable soil was proportionately deepened and most carefully cultivated; the culture of forage and the stock were augmented almost incredibly; and the chief thing of all was the most careful preparation of the barn-yard manure, by means of plaster. During the principal's management, he attended to having the manure forthwith brought out of the stables into the ground; but when this was not practicable, for good reasons, then not only the dung-heaps, as soon as its odor betrayed a development of gas, was strewed over with plaster, now and then covered with earth moistened with liquid manure, and tramped down as solid as possible by the cattle, but also all the cattle-stalls were strewed with plaster twice every week, and the sheep-fold was strewed over with the plaster every morning, lest an atom of ammonia should evaporate into the faithless air; and yet the plaster could be obtained at no cheaper rate than by v. Fellenberg.

Thousands of acres furnished the most indubitable evidence of the excellency of this preparation of the manure; and the domain of Beberbeck may be considered every year more and more a model farming establishment.

On this subject all should ponder who complain of scarcity of manure, and especially those who can buy plaster still cheaper, or those on whose lands top manuring does not take proper effect; but pulse, clover, and clover grass will grow after plastered manure, even if these crops did not thrive well otherwise.

After this general, comparative argument in favor of the preparation of manure with plaster, we return to the special evidence of v. Fellenberg. He directs the attention to the luxuriant vegetation of clover, remarking that then the clover need not be plastered upon the leaf, and that he had, at the second cutting, not only stalks of 4 feet in height, but that he gathered from a Swiss acre (juchart), at 400 square rods, 40 hundred weight of clover-hay at the first cutting, and 60 cwt. of clover-hay at the second cutting, or nearly fodder enough to feed a cow for a whole year from one juchart, 70 cwt. per Prussian acre.

The same results are observed in grain crops, by their luxuriant roots and stems, and by getting more grains, and these more perfect. So he reaped, last year, upon plastered manure, of spelt 12, of wheat 15, of barley 20, and of rye, 13 malter from the Swiss juchart, or 27 grains for each grain seed. His neighbors, having used unplastered manure, were compelled to be contented with much smaller crops.

But did the plaster alone produce these results? To answer this question in the affirmative, unconditionally, would be a delusion. These results are attained, and are relatively attainable, only by the above-described very careful (and it might be styled paltry, when once learned) and easy method of preparing the manure, by applying plaster. Without this great carefulness, the effect of the plaster would not be so powerful, because, if the air had more ready access, decomposition would commence in the heap, whereby the combinations formed for the conservation of the nitrogen would again be dissolved and destroyed.

The ammonia is known to enter the plant, not as sulphate but as carbonate of ammonia; thus, it must be decomposed again in the soil. This decomposition is to take place in the ground, but not in the manure-heaps, otherwise the application of plaster would be a failure.

This preparation of manure, with the application of plaster, is not sufficient to produce a large quantity of powerfully operating manure; much depends upon the keeping of the stock of cattle, in general.

Cattle poorly kept and fed give little and poor manure. A middle-sized cow, well and economically fed, requires daily about 30 lbs. of hay, or its equivalent, one-half of which is calculated as her sustenance, the other half as productive feed—making about 110 cwt. of hay, or its equivalent, requisite for the year.

Now if, for instance, 1100 cwt. of hay is fed to 10 cows, of course a larger quantity of manure will be obtained than if 15 cows are fed on the same amount of hay, because then 20 lbs. of hay daily would be the share to each cow—or 15 lbs. of hay as sustenance, and only 5 lbs. of hay as productive feed, would be consumed. Without taking into consideration the inferior manure made by such badly-fed cows, there would be lost, to the production of manure, 75 lbs. of hay daily consumed as sustenance for the extra five cows, or about 270 cwt. of hay per year. But if we suppose that of the feed given to the cows, only the productive feed produces manure, and the feed for sustenance is consumed exclusively to keep the animal *in statu quo*, there remains only 5 lbs. of hay per cow daily; and thus we would lose daily 10 lbs. per cow for the productive manure, amounting to 548 cwt. per year. This 270 cwt. of hay, with the litter, would have produced 130 cwt. of manure, but 548 cwt., with the straw, about 1500 cwt.

This simple illustration shows that the abundant feeding of cattle is of great importance to the production of manure.

If the productive power of the cultivated soil does not gradually decrease, on account of the cattle being badly ed, the loss of manure above stated must be replaced by money—by buying what is lacking. But if the cattle are fed abundantly, and proper care is taken that all the nitrogen be conserved in the manure, we need not apprehend that the known strata of guano and Chilian saltpetre will be exhausted, before new and still richer sources of vegetable nutriment will be discovered, by unceasing scientific investigation and by practical agriculture, resting upon the broad foundation of physiology. Ever since the beginning of the present century, the investigations of the unlimited field of agriculture have produced wonderful results; yet there is no doubt that, at the threshold of the next century, our descendants will be justified in calling our present scientific accomplishments only a well-meant and, therefore, praiseworthy scientific beginning.

Nevertheless, we will cheerfully return to our task, and we repeat it to all our worthy colleagues who will listen, that a nitrogenous manure, according to the law of nature, must always increase the productive power of the soil, if we are not induced to raise too many marketable products, which do not return any manure to the soil.

Von Fellenberg writes: "Four years ago, when I took possession of my paternal manor, I found it very much exhausted; the lessee had, during a period of 20 years, worked only to his own benefit; and I found every thing waste and desolate.

"During the first summer I was hardly able to feed the four horses and six cows I received; rye produced scarcely six-fold; clover remained little and feeble; of hay and after-math I could hardly reap 15 cwt. from the juchart; potatoes and bulbous plants yielded very poorly; in short, the estate was completely exhausted, and caused me some loss.

"Now I am able to keep twelve to fourteen cows and six horses.

"All this was accomplished without purchasing any manure—without bone-dust, guano, or Chilian saltpetre—or any feed; there was purchased only about 100 cwt. of straw per year, because but little grain could be sown in the beginning; and, besides, the oats were required for the horses.

"Since the lands had been properly cultivated before I took possession, this extraordinarily rapid improvement of the estate and increase of the crops may chiefly, if not exclusively, be attributed to the very careful accumulation of manure."

It is plain that some expenses were connected with this; but who could, without an equal amount of expense, have produced similar results? Surely not by applying guano and Chilian saltpetre. By fish-guano, by manuring with sea-grass and weeds? Such assertions must be proved by figures, which will remain true as gold upon the touchstone of long experience.

Then we will yield, but no sooner. It is the agricultural chemist's life task to unfold, by the aid of all scientific arguments, the results obtained by these processes, in the laboratory of experimental agricultural chemistry.

Von Fellenberg further writes: "For a beginning, I can expect no more than that, every year, fully one-third part of the cultivated land can be manured, with over 300 cwt. of manure per juchart, and one head of cattle can be kept upon every 3 jucharts of soil of middling quality."

Then, with an exact economical management, every year there can be manured as many jucharts (acres) of cultivated land as there are head of cattle in the stable; and each and every head will produce the manure requisite for an acre per year; or, in other words, with every head which, as the yield increases every year may be added to the stock, in the course of time, one more acre of land can be manured.

This result is confirmed, if we take for the basis of our calculation, in the transformation of the food and the litter, the factor of 2.5 lb. of hay or its equivalent × straw = the quantity of manure. If we estimate the food of a cow, per year, at 110 cwt. of hay, or 30 lbs. per day, and the straw at 25 cwt., we find 110 × 2.5 lbs. = 275 + 25 = 300 cwt.; and from this it is also evident that, since the average yield of straw per acre may with safety be estimated at 25 cwt., on only as many acres of land straw-producing crops need be raised, as head of cattle can be kept, or are intended to be kept.

In the above calculation, all the liquid manure, and other collections from the stable, are not taken into account, being equal to such a cash amount as will amply pay all the expenses of the above-described preparation of man[illegible].

Here we may state, also, the method in which v. Fellenberg prepares horse-dung, because it may be instructive to many farmers. As the horse-dung, on account of its peculiar dryness, cannot be tramped down very solid upon the dung-hill, but will easily mould, therefore it is brought upon the dung-heap only after it has lain for about 14 days on the watering place, in the immediate vicinity of the well, and, being wetted there, has become a more compact mass. When thrown upon the dung-hill, it is forthwith strewed over with plaster.

The liquid manure flowing from the dung thus prepared has a very strong odor of sulphuretted hydrogen, and is a powerful fertilizer. It is entirely neutral to litmus paper, which proves that no more free ammonia is contained therein, but that it has been completely fixed by the sulphuric acid of the plaster.

But against the above-described method of preparing manure, the objection may be raised that it aims too partially at the conservation of the nitrogen, and pays too little attention to the other important vegetable nutriments, such as phosphoric acid and alkalies. This objection is easily refuted.

In general, cultivated soil, if regularly manured, possesses enough of those volatile matters, so that their exhaustion may not be apprehended, especially if it is manured with stable-dung—the only manure which we call a perfect manure, because it contains *all* the substances required for the growth of plants; and moreover, an exhaustion of the soil need not be apprehended, with a careful, assiduous and deep cultivation, by which the mineral substances contained therein are broken up and made accessible to the plants.

But here also an analysis, made in accordance with the strictest rules of "*black art*," furnishes the proof in figures.

The soil selected for experimental investigation was a wet, cold and sterile loam-soil.

Examined to the depth of one foot, and calculated upon the area of a Swiss juchart = 1.4 Prussian acre, or on 40,000 cubic feet, @ 80 lbs., there were found the following quantities of the principal nutritious substances for plants:

| | | | |
|---|---|---|---|
| Soluble humus | 2½ per cent | = 800 | hundred weight. |
| Insoluble humus | 5⅔ " | = 1800 | " |
| Alkalies | 4⅓ " | = 1384 | " |
| Phosphoric acid | ½ " | = 160 | " |
| Carbonic acid | ½ " | = 160 | " |

Of substances of secondary importance there were found:

| | | | |
|---|---|---|---|
| Iron | 1.10 per cent | = 440 | hundred weight. |
| Lime | 0.80 " | = 320 | " |
| Argillaceous earth | 6.80 " | = 2,720 | " |
| Siliceous earth | 60. " | = 23,800 | " |

If the analysis had been made of a rich, long-cultivated soil, quite different and perhaps astonishing figures would have been obtained; at all events, there is not the least [illegible]son to apprehend that the soil may be exhausted by continuous nitrogenous manuring. Such quantities as shown by the above analysis will suffice to furnish hundreds of crops with the necessary mineral nutriments, without taking into consideration what is returned to the soil by regular manuring.

In manuring with 300 cwt. per juchart, the soil receives of the principal nutritious substances for plants:

I. About 60 lbs. of phosphoric acid;
II. " 335 " alkalies;
III. " 300 " calcareous earth, magnesia, iron, &c.;
IV. " 150 " nitrogen.

According to Boussingault, the crops of a regular rotation do not take more mineral substances out of the soil than are returned to it by the regular manuring with the stable-manure of the same farm.

The same author's investigations show that the same crops contain more nitrogen than the manure they received: therefore, the crops must have taken their surplus of nitrogen from the atmosphere and the humus in the soil.

Now, if cultivated plants are furnished by the manure with nitrogen more assimilable by the roots than by the organs of their leaves, in order to restore the equilibrium between the roots and leaves, as absorbing organs, they will also absorb more nitrogen, in form of ammonia, from the atmosphere, and, consequently, the yield will be considerably increased.

If cultivated plants are furnished with a surplus of nitrogen, then they are enabled and compelled, through the abundant absorption of the same, to assimilate also more mineral matter, in order to restore, according to their nature and constitution, the proper proportion of the inorganic to the organic matter; and thus it is explained why continuous, mere nitrogenous manuring, *with a total exclusion of any supply of mineral nutriments*, will exhaust and impoverish the soil, after the lapse of years, but surely at last. This is proved by experiments instituted by the most celebrated men of France, Belgium, Holland, Great Britain, and Germany.

With these facts before our eyes, it would be idle if we would, at heavy expense, furnish the soil with those substances by the pound, which it already possesses by the hundred weight, but pay no attention to those substances—such as nitrogen and phosphoric acid—which are indispensable, and of which it never can receive too much;—and the chief of all is the nitrogen.

If we can procure that cheaply, we may look confidently into the future, and rest assured that, if we do not cultivate too imprudently, the productive power will continually increase, and with it the yield of the soil.

Further, if we take into consideration the beneficial influence which ammonia exercises upon the soil, by its dissolving, alkaline properties, and that it, being abundant in the soil, furthers the decay, the loosening and dissolution of the same —in a word, the preparation of vegetable nutriment, as Stoeckhardt pertinently says, in such a high degree, there surely can be no objection to our strenuous efforts to enrich our cultivated soil as much as possible with nitrogen.

This solving operation of the ammonia is fully evident from the fact, that notoriously sterile soil, manured exclusively with chemically pure carbonate of ammonia, has been made to produce remunerating crops.

*In short, home-made manure is the soul of agriculture, and nitrogen the quintessence of manure.*

Yet a word or two on the best method of treating liquid manure.

The chief thing in preparing liquid manure is a good reservoir which will allow nothing to leak through, but is as close as possible. If the liquid manure is kept in this way, we will not smell it.

The case of liquid manure is known to be similar to that of wine. Grape-must is not yet wine, and has not the same properties. Must is cooling, wine warming, and yet the latter originated from the former.

So it is with liquid manure, if, like must, it ferments in well-closed reservoirs, i. e., if it is completely protected from the access of air. It undergoes a transformation, hardly to be noticed: the lithic and other nitrogenous combinations are decomposed; carbonate of ammonia is formed, which is the same in liquid manure as spirit of wine in wine—*the spirit in the matter*.

If the liquid manure is kept in such well-closed reservoirs, protected from rain and sun, it will remain unchanged, and may be kept for a long time without losing any appreciable quantity of nitrogen, as wine kept in well-bunged barrels will retain, for a long time, its spirit and aroma.

When liquid manure is hauled upon the field, it soon sinks into the loose soil, and only a trifling evaporation of ammonia may be apprehended, and this may be entirely prevented if the field manured with liquid manure is also plastered forthwith;—but how would the costs then be?

If volatilization be entirely prevented, the last atom of ammonia has to be saturated with acid; for otherwise the unsaturated ammonia would volatilize, at all events; but this requires such quantities of disinfecting agents that the costs will not be covered by the increase in yield.

Von Fellenberg has a regularly-constructed reservoir for liquid manure, which holds about 60,000 kilogrammes = 1200 hundred weight of liquid manure, and which generally is filled thrice a year, and of course emptied as many times. As no rain-water can flow in, it is completely concentrated. At a low estimate, we will suppose liquid manure to contain only ⅓ of *one* per cent. of ammonia;—different reliable analyses of liquid manure have shown that it often contains from ⅓ of 1 to 1 per cent. of ammonia.

The complete neutralization of the 60,000 kilogrammes (= 1200 hundredweight) of liquid manure would require about 1 per cent. of common sulphuric acid, or about 1,200 pounds; if sulphate of iron should be used, it would require about 3,000 pounds.

Thus the preparation of that amount of liquid manure with sulphuric acid would cost about 540 francs per year; with sulphate of iron, about 900 francs. Can such great expenses be covered by the increase in yield per year? The effect of the liquid manure we cannot suppose to last any longer.

Now, if to manure one juchart (Swiss acre) of grass-land with liquid manure would, at a very moderate estimate, require 45,000 pounds per Prussian acre (= 6 pounds per 5⅓ square feet), and were we to bring this quantity completely disinfected upon the land, then this maneuver would require 450 pounds of sulphuric acid; thus about 5½ grammes (= 1⅜ drachms) of sulphuric acid would come upon each square foot of ground by pouring on liquid manure but once, and 16½ grammes (= ½ ounce nearly) by pouring it on thrice. It is very likely that such a quantity of acid may have an injurious effect upon the land.

Repeated comparative experiments, made by v. Fellenberg, with neutralized and non-neutralized liquid manure, did not show the least difference in the yield.

If we investigate more minutely the disinfection of barn-yard manure and of liquid manure, we must observe a very essential difference.

In the case of barn-yard manure, which easily becomes heated, and, lying in the open air, is exposed to all atmospheric influences, disinfection is much more necessary than in the case of liquid manure, which, containing much water, becomes less heated, or not at all, and therefore should be kept hermetically. At all events, the admixture of a chemical fixing agent to barn-yard manure appears to be more necessary, more effective, and therefore more important, than the disinfection of liquid manure.

Besides, the results of vitriolizing liquid manure, formerly much in vogue in Switzerland, have shown that vitriolized liquid manure has an injurious effect upon the soil, and that the continuous use of it has completely impoverished grass-land formerly very productive. This result has never been observed where the common liquid manure was used.

Since grass-land spoiled, or, as it were, poisoned with vitriolized liquid manure, can be made productive again only by being plowed and cultivated for several years, this should cause us to infer that the soil was overcharged with acid and iron, which substances could not be well digested because the soil was closed by the grass-sod. At all events, it is the reason why this method of preparing liquid manure is more and more discarded.

On the contrary, all farmers in Western Switzerland, having, as also v. Fellenberg has done, adopted the method of Mr. Huenerwadel, of Schinznach, a bathing-place in the canton of Aargau, hitherto derived only favorable and in no way unfavorable results from preparing liquid manure with plaster; and the discoverer of this new method of manuring can show by figures that he has reaped crops yielding from 40 to 50-fold, although the seed had been sown sparingly.

That we are not disposed to disparage the value of artificial fertilizing agents, I may quote from another writer, in an essay "On the Practicability of using the Spade in cultivating larger Estates," to which the General Agricultural Society of the Kingdom of Hanover awarded the prize:

"The manure produced on the farm itself is always the most natural fertilizing agent of the land. Before artificial manure is purchased, all possible available sources for making manure upon the farm should first be exhausted; but then it should not be delayed any longer, and, if necessary, the money should be borrowed from the banker to buy the necessary manure.

"Favorable results cannot be doubted.

"Although artificial manure, guano and Chili saltpeter will not fully supplant animal manure, yet they are of great importance, as purchasable and easily transportable additional manure, for aiding the growth of sparse and damaged crops, and for being used on far remote and impassable fields, and on lands or real estates whose fertility shall be increased, and be perpetuated in a considerable degree, in a short space of time. Another reason for purchasing artificial manures is their favorable effect upon the production of straw, so that a farm, by applying such agents, will be benefited not only transiently, by this increase of nutritious matter for the plants, but also permanently, by an increased production of straw and manure. Further, we acknowledge that the adage 'Time is money' is equally applicable in respect to the realization of the capital invested in manure, and, according to circumstances, should be the rule of every thinking and calculating agriculturist."

Finally, then, we are convinced, in an agricultural technical as well as national economical point of view, that every farmer, wherever he may till the soil, may secure, by the above described preparation of his manure with plaster, a never-failing but always increasing source upon his own premises, from which may be derived (if he appreciates his task correctly, and this according to the above calculation) by 90 per cent. cheaper than by using all artificial fertilizing agents hitherto in general use.

All practical agriculturists should ponder over this, and try it; and it is desirable that every learned man in this branch should carefully examine this material, for the purpose of further developing the method initiated by v. Fellenberg; but the proof of our assertion must hold good, not only in the laboratory, but in *practice.*

# BONES.

### HOW FARMERS CAN PREPARE THEM FOR MANURE.

The books and periodicals for years past differ greatly in the proportion of sulphuric acid required for dissolving bones.

In the Patent Office Report of 1856, Mr. Brown recommended five pounds of acid to 100 pounds of bones, and to compost them with muck.

Prof. Gilman, of Virginia Military Institute, in *The Country Gentleman* of 28th October, 1858, refers to an article of Prof. Norton, which recommends 50 or 60 pounds for whole bones, and 25 to 45 for ground bones, and adds that he (Prof. Gilman) found even 100 pounds of acid was not sufficient to dissolve 100 pounds of bones. The real state of the case is, that if it be desired to dissolve all the phosphates in 100 pounds of bones, or about two bushels, we must apply 59 pounds of sulphuric acid whose specific gravity is 1.85 diluted with three times its weight of water; and to effect a complete solution, they must be frequently stirred during three or four weeks. If the bones be whole, it will require many months to dissolve all their phosphates. If it be desired to dissolve a part only, a less proportion may be used. My own opinion is, the less acid the more economical to the farmer in the long run.

We must not omit to count the cost of applying sulphuric acid to bones, which of course will be modified by the proportions used. Let us first ascertain the cost of effecting a complete solution of the phosphate of lime in bones:

| | |
|---|---|
| 1st. 100 lbs. of ground bones, costing | $1 46 |
| 59 lbs. of sulphuric acid (3 cents) | 1 77 |
| We should add for labor and the cost of a vat or tub, which is soon destroyed, freight on acid, &c. | 08 |
| Total | $3 31 |

2d. If we use acid sufficient to dissolve half the bones, the cost will be as follows:

| | |
|---|---|
| 100 lbs. bones | $1 46 |
| 30 lbs. sulphuric acid (3 cents) | 90 |
| Labor as before | 08 |
| Total | $2 44 |

As a bushel of bones will average in weight 45 pounds, we have to deduct 55 per cent. to get at the cost of one bushel; therefore,

| | |
|---|---|
| One bushel fully dissolved will cost | $1 49 |
| One bushel half dissolved will cost | 1 10 |

It will be seen, therefore, that by dissolving we much more than double the cost, and if but half dissolved their cost is increased more than two-thirds in amount.

Great care should be taken when sulphuric acid is poured into water. It must be done gradually, as it generates heat above the boiling point, and is apt to be thrown in the face and on the clothes of the operator.

Sir J. Murray thinks dissolving bones with sulphuric acid objectionable, because there is loss by the soluble phosphates being carried off by water, but there is reason to think that the cause of their effects being so slight after one or two crops is more owing to certain known chemical reactions in the soil. Soluble salts of alumina and iron, especially the latter, are never absent from soils; and when a soluble phosphate of lime comes in contact with either of these, the phosphoric acid is precipitated as phosphate of iron or alumina, both of which, according to Bischoff, are the most insoluble substances known in water and carbonic acid, but some experiments of Dr. Piggott prove that they are soluble in alkaline silicates.

If there is suspicion that ground bones are adulterated with foreign matters, they can be readily detected with a good pocket lens, which every farmer ought to possess, and also sifted coal ashes used to adulterate wood ashes and other manures can be detected, as the smallest grains of coke or coal, always existing in coal ashes, will be exposed by the same means.

The following directions for preparing bones on the farm are extracted from the report of Philip T. Tyson, State Agricultural Chemist, Maryland, who has been engaged many years in agricultural investigations:

"I have found no better way of causing the putrefaction and decay of bones than that practiced by me nineteen years ago, after experimenting to some extent, and as inquiries about it have frequently made it necessary to describe the process, it will now be repeated in full.

"Having smoothed over the surface of the ground (under a shed, if convenient), place thereon evenly a layer of three inches of ground bones, and then an even layer of good fine soil or earth free from stones or sticks. Give a good sprinkling of gypsum over each layer of earth. Another layer of bones is applied upon the layer of earth, and the same alternations are to be repeated with the gypsum until we have four of each, bones and earth, and the height of the pile will be 24 inches. As the bones are usually dry, each layer should be well moistened with water, or, better, with urine, in order to hasten the process. It is proper to place two or more sticks in the pile, reaching to the base, which should be frequently examined by feeling them, in order to judge of the degree of heat produced. If the weather be warm, they will begin to heat in a few days, and in a week or two will become hot. When, upon taking out the stakes, they feel unpleasantly hot, the process should be checked by chopping or spading down the mass from top to bottom, which, if carefully done, mixes the materials well together, and they are ready for spreading. If the process be commenced during cold weather, it may be hastened by placing at the bottom a layer of fresh horse-dung about six inches thick, and covering the pile with straw or fodder to retain the heat. If salt is used as a manure, it cannot be applied more advantageously than with the bones, because it promotes their solubility. It would be better to place the proper dose of salt with the gypsum upon each layer of earth. After trying bones in quantities from 30 bushels down to 10, I conclude that 10 bushels to the acre is the most advantageous quantity. I became satisfied also that ten bushels, prepared as just indicated, will be as effective for a year or two as double that quantity applied in a dry state. If, when wheat ground is dressed with dry bones, the soil be dry and continue so, but little effect will be produced on the autumn growth.

### DURABLE EFFECT OF BONE MANURE.

"The effect of putrefied bones will be obvious in a few days after the wheat appears above the surface. In ammoniated guano decay has progressed till nearly all its contained ammonia is already formed, and as it is very soluble, it is rapidly washed off during heavy rains, so that when the soil is not frozen in winter the ammonia is passing off, and there is no crop to appropriate it.

"When bones are applied, either dry or in the manner just suggested, they give out their ammonia as the crops require it, but in cold weather the putrefaction is nearly or quite suspended, and again resumed in spring, becoming more rapid in hot weather, when it is most wanted for the crop. Experience has shown that the effect of bones in stiff clay soils is not so prompt as in those of porous character; the compactness of clay prevents sufficient access of air for the decay of bones. In very wet soils ainimal matters decompose so slowly as to benefit crops but little. I had an opportunity lately to notice the durable effect of bones which I applied to land 17 to 20 years since; it continues to produce heavy crops under the judicious management of its present occupant. Loudon, Johnston, and others, say that the effects of heavy bone dressings are clearly shown in England to endure 40 to 60 years."

### ANALYSIS OF SOILS.

Philip T. Tyson, Agricultural Chemist of Maryland, says:

"I have been forced reluctantly to the conclusion that a reliance upon analysis only for sure indications of the causes of sterility in soils was delusive, and would not hold good in practice. Prof. J. C. Booth, of Philadelphia, was the first professional gentleman with whom I conversed that fully agreed with me in this. At this time such views prevail generally with chemists and others who have devoted themselves to investigations connected with this important subject. Dr. Anderson, Professor of Chemistry in the University of Glasgow, and Chemist to the Agricultural Society of Scotland, fully expresses similar conclusions. He says: 'It has been found while in some instances it is possible to predict with certainty, from analysis, that a particular soil is barren, in numerous others a barren and a fertile soil may approach so closely in chemical composition that it is scarcely possible to distinguish one from the other. The majority of analyses fail to give the information desirable for practical deduction. This may, in part, be owing to imperfect analysis, but it is certainly mainly due to imperfect knowledge of the chemical conditions requisite for fertility.'

"I have already referred to the conclusion that most chemists have arrived at in reference to the analysis of soils for practical applications, but I find I have omitted to notice a very remarkable case of a soil from the Island of Cuba, containing *ninety per cent. of oxide of iron.* The sample was analyzed by Prof. Hayes, of Boston, and was from a soil producing fine crops of tobacco. The result seemed so strange that I made inquiry of the doctor in reference to the truth of the published statement, which he confirmed. Now, if any chemist were asked to name an article containing 90 per cent. of oxide of iron, would he call it a soil? Would he not call it a very rich iron ore?

"Phosphate of iron, as before stated, has been proven to be soluble in alkaline silicates, which must exist in every soil in which grass or grain can grow. It has also been proven that oxides of iron, while undergoing certain changes in the soil, promote the formation of ammonia and carbonic acid. This will probably account for the fact of the growth of fine tobacco in a soil containing 90 per cent. of iron, previously mentioned.

"Prof. W. R. Johnson's analysis of coal indicates that it is nearly, if not altogether, useless as a manure. The very few cases in which it has been of any service whatever were on stiff clays, by tendency to make it more porous. This purpose, I am sure, can be effected as well or better with materials on the farm or vicinity, at much less cost.

"*Jersey Irish Potatoes.*—An article in *The Country Gentleman*, January, 1859, throws some light on the cause of their good quality, after showing, by statistics, that the quantity in four counties had been nearly quadrupled between 1840 and 1850. The writer says: 'I suppose that the preference given to Jersey potatoes is owing to the fact that green sand is almost the only manure used in raising them. It is the common opinion in Jersey that potatoes so raised are much better than those from heating manures.'"

# ON GRASS LANDS,

## THEIR VARIOUS KINDS, AND THE BEST MEANS OF PERMANENTLY IMPROVING THEM.

BY ROBERT SMITH, EMMETT'S GRANGE, SOUTH MOLTON, DEVON.

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[From the Bath and West of England Society for the Encouragement of Agriculture]

It is now very generally admitted that it is to the Grass Lands of England, in their several varieties, we must hereafter look for our main supplies of animal food during the summer months. The proper treatment of such lands is therefore a matter of great national concern, and the question derives additional interest from the fact that, while arable farming may be said to have a copious literature of its own, comparatively little has hitherto been written on the subject discussed in these pages.

By the general term Grass Lands we mean, not only rich grazing ground and marsh and meadow lands, but also such portions of the arable as in a due course of rotation are occupied by artificial grasses. We have therefore a large and comprehensive subject, and had not the botanical department of it been already dealt with in former volumes of this Journal, we should have thought it necessary to introduce our practical remarks by a cursory glance at the natural history of the grasses. For present purposes, however, it will be sufficient to observe that the grasses, popularly so termed, clothe the surface of every zone, and though varying in character and substance according to the soil and climate in which they are found, they may be represented as indigenous to the whole earth. Thus the best grasses are found in the more even climates, where there is the least cold in winter and no excess of heat in summer, whilst others vary according to the influence of local circumstances, each class having its peculiar affinities and functions in the vegetable kingdom. It hence follows that, while no department of agriculture is generally thought more simple and easy of execution than the culture and improvement of the grasses, yet, from their great variety and the special adaptation of particular genera to particular kinds of soil, considerable judgment is necessary in order to effect permanent improvements.

Until recently very many occupiers endeavored to increase their arable lands by "getting leave" to break up some old field or fields then said to have "a natural complaint about them, only to be cured by the plough;" but only in rare instances were they found converting arable lands to permanent pasture. There is now a more decided course in favor of grass, and the question, "How to increase our grass land," arises at every turn. And yet a large proportion of the grass lands of England still remain unimproved, and in many instances neglected. This is particularly the case in districts where, in comparison with the arable land in occupation, the extent of grass lands is disproportionate and excessive. An important illustration of this point is furnished by the following extract from a statement as to the condition and appropriation of the land in the United Kingdom, delivered to a Committee of the House of Commons by Mr. Couling, even as far back as the year 1827:

*Extract from Mr. Couling's Report*, 1827.*

| | Arable and Gardens. | Meadows, Pastures and Marshes. | Wastes. Capable of Improvement | Wastes Incapable of Improvement | Summary. |
|---|---|---|---|---|---|
| | Statute Acres | Statute Acres. | Statute Acres. | Statute Acres. | Statute Acres. |
| England............ | 10,252,800 | 15,379,200 | 3,454,000 | 3,256,400 | 32,342,400 |
| Wales.............. | 890,570 | 2,226,430 | 530,000 | 1,105,000 | 4,752,000 |
| Scotland ........... | 2,493,950 | 2,771,050 | 5,950,000 | 8,523,930 | 19,738,930 |
| Ireland ............ | 5,389,040 | 6,736,240 | 4,900,000 | 2,416,664 | 19,441,944 |
| British Isles ........ | 109,630 | 274,060 | 166,000 | 569,469 | 1,119,159 |
| | 19,135,990 | 27,386,980 | 15,000,000 | 15,871,463 | 77,394,433 |

It must, however, be observed that since the date of the foregoing return much additional land has been inclosed. Between the years 1827 and 1844 at least three hundred Inclosure Bills were passed by the Legislature; and from the Fourteenth Report of the Inclosure Commissioners, made to Parliament in 1859, we learn that since the passing of the General Inclosure Act in 1835, there have been eight hundred and nine applications for inclosures, 1697 exchanges, and one hundred and sixty-one partitions, etc., making a total of two thousand six hundred and sixty-seven. It is estimated that there are still fifteen million of acres of waste land capable of improvement, six million of which would make arable land, and the remainder improved pasture.

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* To the same authority we are indebted for the following comparative statement as to the four Western Counties, forming the district proper of the Bath and West of England Society, viz:—

| Counties. | Cultivated. | Uncultivated. | Unprofitable. | Summary. |
|---|---|---|---|---|
| Cornwall........................... | 550,000 | 190,000 | 109,280 | 849,280 |
| Devon.............................. | 1,200,000 | 300,000 | 150,560 | 1,650,560 |
| Dorset ............................ | 573,000 | 25,000 | 45,200 | 643,200 |
| Somerset........................... | 900,000 | 88,000 | 62,880 | 1,050,880 |
| | 3,223,000 | 603,000 | 367,920 | 4,193,920 |

Under the general designation of Grass Lands is included land of every kind—from the richest grazing ground, marshes, meadows and uplands, down to the improved and unimproved wastes and moorlands. A preliminary glance at the cultivated grass lands may enable us the better to ascertain their relative condition and determine as to their future management. In doing so we first turn to lands of the best class.

GRAZING GROUND.—This is known as "The Old Grass Land," by which term it is properly designated. It bounds in the Midland Counties, in some parts of the Eastern and Northern Counties, as also in the Western Counties, and the marshy districts of the whole island. It is on these lands we must depend for our first supplies of animal food in the early summer months. But even these lands are frequently of two distinct sorts, viz: (1) the really strong Ox Land resting upon cool subsoils; and (2) the second-class lands resting upon porous subsoils, or placed within southern aspects; the latter are frequently used for mixed grazing, either for the second stage of fattening cattle, growing steers, dairy farming, or fattening early lambs—the choice being governed by the holding.

The Ox Land consists of that portion of the farm which has been under natural grass form time immemorial. Those plots are the most luxuriant which have the greatest depth of soil—the period of production varying according to aspect, and the character of the subsoil on which they rest. For instance, upon gravelly subsoils the grasses are exceedingly early in their spring shoot, and they retain their vigor until impeded by the increased warmth of the summer's sun; they then lie dormant for a while, but rally as the autumn advances, when they again become exceedingly valuable to succeed other pastures situated upon a different description of soil. Pastures resting upon a clay or cold subsoil vary materially in their period of productiveness; they are more backward in the spring, but progress with the warmth of the summer, and are thus "in season" during the hottest months. We rarely, if ever, find this class of land assisted by top-dressings of artificial or other manures; in fact, the great value usually placed upon them arises, firstly, from their natural productive powers, and, secondly, from their cheap maintenance, as regards both labor and manures.

The grasses upon the best rich MARSH LANDS are really indigenous productions, formed upon an accumulated mass of vegetable mould, and are of themselves sufficiently rich without the aid of manures; still they require to be kept in proper bounds by close feeding, so that every blade may be allowed to see the sun at least once a year. Where this is not attended to, an accumulation of rough grass takes place, and the herbage becomes changed in character and less nutritive in quality. The importance of assisting Nature, rather than marring her works, is thus most forcibly shown.

The SHEEP or MIDDLE CLASS LANDS, which are usually stocked with both sheep and cattle, are of two classes, arising from a difference of soil; indeed, it will be found that the herbage upon dry soils, as compared with that on moist soils, is more rapid in its growth, especially in the spring, though it does not "hold out" equally long. These lands are both simply and cheaply managed; but no grass-land pays better for attention than the early lands, as their produce comes to hand at a time when most required, after a long and tedious winter.

**Pastures** which rest upon flat land, of moderate quality, upon cold bottoms, which are frequently undrained, or upon "worn out" fields, are much more backward; they are therefore used as **summering** pastures, and in most instances relieve the earlier fields of a part of their stock about *Midsummer-day*, when the two best months are gone. The retention of these lands may be considered a useful arrangement upon a farm, but will be found to cause disappointment if estimated by their rent-paying qualities; for though their management is simple and uncostly, yet no improvement is going on. It is this class of grass-land that requires most outlay and prompt attention. Many of our marsh-land districts contained the best *thick-bottomed* sheep pastures, such as have at some former period been rescued from the sea, or are found within reach of the salt-water spray, upon which sheep are found to be exceedingly healthy—a fact indicating the importance of salt, both as a fertilizer for pasture-lands and a promoter of health in cattle and sheep.

**Meadow-ground** varies with the soil, situation, and climate of the district wherein it is found. The character of the herbage also differs, as it is closely governed by the mode of treatment pursued. Even the aspect of a meadow has much to do with early productiveness and the quality of produce. This portion of the farm is usually under "the scythe," and, as the winter supply of fodder greatly depends on it, it receives a degree of attention seldom paid to other grass-lands, but nevertheless necessary to the carrying on of certain fixed plans in the farm-yard. There is, however, such a thing as disproportionate attention or neglect, for in nearly every district we find the greater part of the perennial grasses to be the spontaneous yield of Nature, and it is a very important question in what way the generous productiveness of Nature may be most advantageously stimulated.

As the selection of meadow-lands is governed by the size and character of the farm, care should be taken that they are so placed as to be favorable to early growth; that they are conveniently situated for harvesting and manuring; and that they do not touch on the later lands—usually situated in the valleys, and along the lower slopes of the farm—which succeed the upland early meadows, and produce an abundance of hay, usually carried to the homestead: a convenient practice, and not costly, as this class of land rarely, if ever, gets any return in the shape of manure.

**The Real Marshes.**—Some of these have been brought to a surprising pitch of excellence, by judicious outlays of capital, in draining, in improved outfalls, and in the judicious management of the surface; while others are yet lying as useless swamps for wild fowl, and continuous pests to the surrounding neighborhood.

**Moorlands.**—There are certain moorlands which are exceedingly useful during the summer months, for depasturing cattle and sheep from certain arable and small farms. When situated in low and comparatively mild districts, they form useful appendages to adjoining farms. These are usually within the reach of common cultivation, but much depends upon their geological formation, on the nature of the subsoil, and on the proximity of manure and markets.

In dilating upon the comparative acreage of our grass, arable, and unimproved lands, an accurate statistical account, brought down to the present day, would be exceedingly useful; for though the importance of grass-lands in our humid climate, as also to our national agriculture, is known to many, it is not to all. The prejudices in favor of the "barn-door" are yet great, and in the corn districts almost unsurmountable.

As it is the practice in many parts of England to apply the whole of the manure made upon the farm to the arable lands, enormous advantages are derived from the meadow-lands, equal in many districts to six loads of manure to every acre of corn. The grass-lands are thus regarded as legitimate sources of plunder to be lavished on the petted tillage fields; yet such a practice greatly lessens the value of the fee-simple of the grass lands, and only serves to illustrate the adage of "robbing Peter to pay Paul." On the face of things, it appears that a reduction of the arable lands, by their conversion into pasture, would meet the case before us, while every improvement of the present pastures might also be made, and should most certainly be carried on. For instance, if we consider the grass-land subject LOCALLY, we have, in a majority of cases, every-day evidence of its "paying better than corn;" that is, where the climate is favorable, and grass can be grown to advantage. If POLITICALLY, we have the evidence of the past year before us, that the foreigner can, and will, supply whatever corn or breadstuffs we require, and not only so, but will take advantage of placing it under "lock" until an advantageous time arrives for bringing it in competition with home-grown corn in our own market! On the other hand, in the market for produce arising from the grass-lands, we have less competition from the importation of live stock and other perishable commodities, which must go at once into consumption. Again, if regarded as a LANDLORD'S QUESTION, there can be no doubt as to the increased and increasing value of grass-land; and if this remark applies generally, it is more particularly applicable to those districts where, owing to humidity or other local causes, stock-farming is carried on as a rule.

Practically speaking, no occupation can excel that of a *grazier;* for, though it may not be over profitable, yet his animals perform their own labor, by collecting their food; the sheep pays his own shepherd, whilst the hay-crop manures its own land, and, when allowed to do so, affords food for the winter months, only asking for fine weather, and to be laid up early in the spring! Not so with the *arable* farmer. He must rise early, enter upon all the toils and uncertainties of a farmer's life, and then leave the chances of profit upon his crops to the ever-changing elements; for as the wind rules the weather, so the weather rules the harvest. Indeed experience tells us that, while supply and demand regulate prices, the cost and uncertainty of production regulate profits. It is therefore worth consideration, even by corn farmers, how far they can change their present course of husbandry so as to have a larger percentage of the farm under artificial grasses. That it would prove a certain relief to the pocket, the plow, and the land, no doubt can be entertained ; for as much good corn would be grown—the pile of wool and quantity of mutton would be increased—and a few young steers might be run on for wintering.

Whole nations of cultivators have applied themselves to the growth of corn—a task apparently insignificant, but of immense influence on the well-being of the human race ; but how far they have succeeded in " growing two blades of grass where but one grew before," is a question not easily determined. Some sixty years ago Arthur Young estimated the *best* meadow-land to produce from 4 to 5 tons of hay per acre, per annum, at two mowings ; and the *best* grazing-land in Lincolnshire to feed an ox of 80 stone (14 lbs.), and one large Lincolnshire sheep per acre ! In 1861, who has done more ? Few only have done as much ; for, although most men aim at keeping their grass-land " about up to the mark" of former years, and no more, it is not all who even accomplish that. Thousands of acres have been reclaimed, drained, and sown with grass, during the last fifty years ; but taking the great body of the grass-lands of the kingdom, it is notorious that farmers, for the most part, look at their grass-land as a kind of " fixture," not to be improved. Indeed, whilst every possible exertion is put forth in favor of corn-farming, and the steam-grubber is tearing its way through the arable clays, not even a roller is used on the permanent grass ! There must be a cause for this, and we believe it to arise from the fact, that as the returns from capital laid out in the improvement of pasture-land do not come back so directly to the farmer's pocket as those arising from corn, the farmer is doubtful whether it will find its way back at all ! This occurs more particularly under short holdings ; for, as the time will not admit of a proper return to a passing tenant, the grass-land has to linger on, and be content with what the half-starved cattle leave behind them. And yet the rapid increase in our population, the altered state of our labor-market, and the vicissitudes of a fitful climate, all point to the importance of increasing the acreage and making permanent improvements upon the present grass-lands, and thus increasing the supplies of animal food during the summer months.

This subject has recently been discussed by the Central Farmers' Club in London, and Mr. Owen Wallis, in introducing the question, " By what means can the feeding of stock on pasture land in spring, summer, and autumn, be so increased as to supply the demand of an increasing population ?" thus expressed himself:

" With a population rapidly increasing in numbers, and happily also in material prosperity, the demand for meat has increased to a wonderful extent..... It is necessary, therefore, to see in what way, and to what extent, the quantity of meat can be increased..... It is, however, by the extension of our artificial grasses, the improvement of our permanent pastures, and by calling to our aid the use of oil-cake, meal, and other food (to be consumed upon them), in conjunction with the grasses, that we must look for the chief increase in the supply during the summer months. That the productive powers of our pastures have not kept pace with that of our arable land, is only too apparent. Indeed, the latter has been very commonly manured at the expense of the former! .... I am acquainted with a good deal of land that has the reputation of having been, many years since, much better than it is at the present time. This is caused by the deterioration and waste that is going on, by the yearly abstraction from the soil of phosphates and other substances. Where land is used for dairy purposes, this is unquestionably the case. Hence the marked benefits which accrue from the use of bones in the Cheshire and other dairy districts."

The above remarks, by an eminently practical man, are not only important in themselves, but the discussion which afterwards took place amongst the members (men from all counties), went to the one grand point—that it is high time the grass-lands of England should receive their legitimate attention, and thus not only augment the standard beauties of English agriculture, by correcting those yet neglected nooks, corners, and marshes, which are so offensive to the eye, but also increase the animal food of the people by increasing the natural supplies of young growing animals for the grazing districts.

The hitherto neglected state of so large a portion of the grass-lands of England is certainly a blot which disfigures the face of British agriculture. But, now that so many arable farms are brought to a condition "above par," we may yet see a fashion set in, in favor of the grass-lands. This might speedily be done if the same energy, perseverance, and capital were brought to bear upon it as are bestowed upon the improvement of stock, the dairy, or the arable farming of this country: in other words, were farmers to deal with grass as they have dealt, and are dealing, with corn. Nor would the return be found inferior, although, at the outset, the profit might appear to arrive by a much slower process than in the case of corn-growing. But the term "permanent grass" (not to be plowed) has much to do with this matter; for, in fact, every dressing such land receives ought to enhance the fee simple of the estate.

PRACTICAL DEDUCTIONS.—In entering upon some details of the effective management or extension of grass lands, it is advisable to treat each subject under its own head, viz., 1, the work of improvement upon our present pastures; and 2, the extension of grass and meadow lands upon the farm. But it may be asked, "Where shall be our starting-point?" Can we advantageously improve our grass-land, and also extend its acreage upon estates situated in different districts? If so, in what way can it be done? To this we answer:—Firstly, The *improvement* of the present lands may be effected by draining, leveling, top-dressing, and better grazing. Secondly, The *extension* of pasture-land may be effected by remodeling farms, making equitable arrangements with the tenants, and by the landlord giving a substantially helping hand, with a view to their remaining as *permanent* pastures upon the estate.

### THE IMPROVEMENT OF GRASS-LANDS.

We have already glanced at the varied descriptions of grazing and meadow lands—viz., the best, second best, dry inferior, wet inferior, and moor-lands.

The best *old pastures*, the pride of England, are those found around gentlemen's seats, the village, or other favored localities, where our remote ancestors designed and arranged them as domains and pasture-lands for the reception of their animals at different periods of the year, as also for their safety in times of plunder. It would seem, however, that for the forcing of early roots and grasses modern culture regards the new artificial manures as better expedients than those supplied by the presence of flocks and herds. Hence it arises that immense piles of buildings, modern homesteads, have grown up, and enormous outlays of capital have been centred on a given spot. Thus, even to the present time, a majority of the grasses have gone on "in their own way," except where the hand of the husbandman has stepped in with a view to their improvement by cultivation, whether to be again laid down, or to be continued as permanent arable land.

About the year 1846 the breaking-up of inferior pasture-lands became a somewhat fashionable practice. This arose from a variety of causes; and an essay in the "Journal of the Royal Agricultural Society" (vol. vii. p. 192) contains much useful information on the point. By the writer of that essay all the light, dry, sandy, gravelly soils, cold rough pastures, strong shallow loams, peaty soils, heavy cold clays, cold sandy loams, and all pastures of a secondary character, such as those reduced by careless dairy management, &c, were *condemned to the plow!* A number of elevated lands, both dry and wet, sand and clay, were proposed to be planted, and the following lands, in addition to the inferior ones, were recommended to be reserved for pasture, viz: rich feeding pastures, water-meadows, and those that can by any likely means be converted into water-meadows; fine rich alluvial pastures and meadows; accommodation-lands near towns; dairy-farms near towns; lands occupied for the purpose of supplying the inhabitants with milk; lands liable to floods; lands adjoining or near to the homestead; salt-marshes; whilst as to other marshes it was admitted that doubts might be entertained on account of their locality and the facilities for draining them. To this followed a summary of the consequent advantages to the farmer in profit, the landlord in rent, the laborer in employment, and the country in food. In setting forth the advantages resulting from the additional employment for the laborer, it was seriously proposed to *break up* (collectively) four millions of acres of these lands!—and the writer then proceeded to show that, as three-fifths of this acreage would require draining, at an average cost of neary 4*l.* per acre in manual labor, it would require 9,000,000*l.* to be expended in labor alone. These are indeed startling recommendations, but they are less applicable now than to the period at which they were written. There was a time when farmers had unfortunately a glut of labor to contend with, which often entailed heavy parochial rates upon them; but the state of things is now entirely altered. The labor-market has been greatly thinned. Progress in every branch of industry, conjointly with emigration, has been at work; and that great regulator of prices, "supply and demand," has placed so high a value upon manual farm-labor, that but for progress in the mechanical arts, and the application of new machinery and implements to the cultivation of the soil and the marketing of its produce, it is doubtful whether at the present time it would be possible to raise corn-crops at a fair profit to the agriculturist.

Efficient drainage is equally essential to the improvement of the pasture and of arable land. Indeed there seems no valid reason why the greater part of the pasture-lands, when drained, might not be so stimulated by top-dressings that a new class of herbage might be produced upon them, which, by subsequent close-feeding, might be annually improved, and yield a better and much more certain return than under the laborious, costly, and uncertain practice of renovating them by the plow. If left in arable culture, we have the objectionable non-paying outlay for modern farm-buildings: if in pasture, no such outlay would be required.

Another writer, in the "Journal of the Royal Agricultural Society" (vol. vii. p. 503), after enumerating the great benefits to be derived from "breaking up grass-land," proceeds to say: "It would be disadvantageous to break up lands of *first* quality. .... There are many lands, though not of the first quality, yet possessing a sweet nutritive herbage well adapted to the rearing of young stock. Where such are attached to breeding or dairy farms, the proprietor ought to pause before he grants permission to break them up. Even inferior lands situated near towns, or wherever required for convenience, ought to remain in pasture; also the mountain pastures, cold clay uplands, and swampy valleys." The author of this Essay assumes that the new arable fields will be self-supporting; if farmed in a modern way, they will be productive of general good, and, being kept in such a state as to yield a higher rental to the landlord, they will ultimately cause equalization in price of both *arable and pasture lands.* This conclusion might, no doubt, be applicable to the period at which it was drawn; but in lieu of "equalization of price," we find the pasture-lands even still more in the ascendant as regards rent, and certainly more so in respect of demand, as shown by the annual grass-lettings in various parts of the Western Counties for summering-ground.

And here it should be observed that our preceding remarks apply to those soils and fields which were recommended to be plowed up; but the SELECTED GRASS-LANDS—those to be spared from the plow—constitute a better class of lands, more readily acted upon, and quite certain to repay the improver.

There is a good old adage—"The better the land, the better it will pay for top-dressings." For the top-dressing of GOOD pasture-land all or any refuse manures from the yards, weeds, banks, scouring of ditches, and road-scrapings, &c., may be formed into cheap and convenient compost, and applied when most convenient. For SECOND and THIRD RATE LANDS, such as have been already treated of, we have no farm resources left, so that a different course of action must be adopted; and here it is that the real work of improvement has to be carried out. The subject then divides itself into two sections for consideration—viz: 1, the poor and hitherto neglected dry-land pastures; and 2, the rough, cold-lying, wet lands. The question therefore is, Can these be improved at a profit?—and if so, all draining and other requirements being the same, which is the better mode of doing it, by the plow or by top-dressing? To these points we now address our remarks.

THE DRY LANDS.—On these no draining is required, so that the whole comparative outlay for improvements is confined to suitable manures. The choice of manures, to suit the soil and climate, is then the first subject with which we have to deal.*

MANURES.—*Bones*, both half-inch and dust, have been used with advantage in many districts, but more especially in Cheshire, Lancashire, and Yorkshire; in Lincolnshire they have been most successfully used upon arable lands; and it has been noticed that they have produced a remarkable effect upon the subsequent clover-crops. The Cheshire farmers, who rent flat-lying, cool-bottomed land for the purposes of dairy-farming, and thus annually export a considerable amount of the phosphates and other substances which would be returned to the soil by fattening animals, have no hesitation in pronouncing *bones* to be preëminent above all other manures for the improvement of grass-lands, especially when permanency as well as cost is considered. In a wide range of country around Nantwich, and extending to the city of Chester, from 30 to 50 per cent. more stock and dairy-produce is now raised than was done some thirty-five years ago, before the application of bones was so spiritedly resorted to. The soil is heavy, resting upon a clayey subsoil. About 15 cwt. of bones per acre† has been found quite sufficient; and more should not be applied at once, as fatalities have been known to occur to stock feeding on newly-boned land. Indeed the rapid change in the herbage—from one of a thin, poor character to that presenting a rich, full bite—causes cattle to be *hoven*, as is often the case when they are turned on rich clovers.

Bones were used by the late Lord Leicester, at Holkham, on sandy soils, for several seasons, about the year 1837, but were not found to answer, although used with great success on sandy soils in the county of Nottingham. These are singular results. Sandy soils naturally require a body of compost and of heavy material when it can be had, and it is therefore fair to assume that if in the Holkham experiment the bones had been mixed with heavy compost, the result would have been more favorable; for although bones have been used on other grass-lands with less effect, yet failure or partial success has only occurred under peculiar circumstances admitting of explanation. Some object to using bones after the land has been limed, considering that the lime neutralizes the fertilizing properties of the bones; but experiments upon this head have fully shown that it is not so. A responsible tenant states: " The half-acre on which the experiment was tried is a part of a pasture of 100 acres, and the boned part to this day is superior to the rest." There is a difference of opinion as to the state or condition in which bones can be most advantageously applied: some prefer them boiled before use; others apply them raw. In either case, they should be finely ground and applied to the land in early spring, and, if possible, in showery weather.

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* In treating on the subject of manures, we purposely omit allusion to the use of "farm-yard" manure as a fertilizer for pasture land, for, although found so essential to this purpose, its legitimate province lies with the arable sections, from whence it has been derived. It is with the adjuncts that we have practically to deal. Can we improve the pasture lands without injury to the arable?

† At the time these dressings took place, the cost of boiled bones was 4*l*. per ton, that of raw broken bones 7*l*. per ton. On grass-lands near towns, which have for many years been liberally top-dressed with highly putrescent manures, bones do not show so decided an effect.

The refuse of button, comb, and knife-handle manufactories has always been found most effective manure for grass-lands. Bones, from many causes, are now becoming dearer; they are more marketable than formerly, and consequently have increased in price. Still, their wondrous effect upon old grass-lands, especially where the phosphates are being daily extracted, must ever suggest their use upon the cool-lying pastures. Their action upon dry lands is more doubtful, for they can only act by supplying a part of the wants of such soils. We shall greatly err, therefore, if we consider bones alone an adequate manure for land so circumstanced. From this it follows that a repetition of bones in successive years would be next to valueless. In a well-authenticated case, a gentleman who had heard of bones for grass, applied a ton per acre, and, to use his own words, he had "a forest of grass." Thinking that the land could not have too much of a good thing, he next year applied a similar dressing, but this time "it did *not* pay." Bones have been used to great advantage for nearly a century, but the opinions as to the durability of bone-manure are rather contradictory. On grass-lands for permanent pasture, and on clovers for wheat, the effects are both certain and good. The mixing of bones with earthy substances is much recommended, not only as increasing the quantity to be thus applied in substance, but also for the production of heat before they are used. For this purpose boiling is found to be efficacious; but as raw bones decompose more slowly, they are found efficacious for a longer period. Bones may be profitably mixed in compost with burnt earth, rape-dust, pigeons' dung, and other similar substances; in such combination it will be found quicker in effect and more durable than any of them when used singly. In heated bones the gelatine is decomposed, the nitrogen is converted into carbonate of ammonia, and other salts are formed. In a word, bones are an invaluable acquisition in every country where they can be procured, and to every farmer who has lands to which they are applicable.

**Pasture or Arable.**—Quantities of bones are annually imported from the Continent and South America, and many a tract of land which might otherwise have remained barren and useless has been successfully improved by them. Their lightness of carriage is not the least recommendation to their use as a portable manure, and in the north of Devon a machine for sowing compost has been successfully invented and employed by Mr. Cornish, of King's Brompton, whose practice it is to sow a light dressing of lime or bones over his pasture-land every year, damp or wet days being usually selected for the purpose. Mr. Cornish prefers these "little fresheners" to a body of manure at distant periods. The result is, that his farm has become notorious for fattening stock.

**Lime** is an important fossil manure; indeed, it may be said that no soil is fit for much which does not contain a portion of it, either naturally or supplied artificially. "Fossil manures," observes Sir H. Davy, "must produce their effect, either by becoming a constituent part of the plant, or by acting upon its more essential food, so as to render it more fitted for the purposes of vegetable life." Lime has a magical effect upon some pasture-lands, which would not bring their produce to maturity under the most liberal use of dung, if applied alone; for not only has lime the effect of absorbing moisture from the air, which is in the highest degree useful to the grasses on dry lands, but it also acts mechanically upon the clays and improves the loams. Lime is applied to arable lands when they are in fallow; this is a good practice, especially when it is intended that the fields shall be laid down to pasture, since at this period the soil is more finely pulverized, and the small particles of lime become the more readily and evenly incorporated with the soil. The full benefits of lime, however, have rarely been experienced, by reason of too small quantities being applied. The marked effect produced on the clover crops, in rotation upon the arable land, points to similar results from the application of lime to pasture-lands as food for the grasses.

Lime is extensively used for top-dressing in many parts of England and Scotland, but in no district is it more commonly used than in the West of England, especially in Devonshire. When applied to dry grass-land, in the proportion of about 25 corn-sacks or 2½ tons per acre, I have found practical benefit to arise from it; and although this may be considered by some a moderate dressing, it must be remembered it has to be paid for by tenants' capital. In most cases 4 tons per acre would be ample for one dressing, especially when mixed with earth; although, where landlords have given a helping hand, as much as from 6 to 8 tons per acre have been used. As an instance of marked success in the use of lime—although in this instance 8 tons per acre was the quantity applied upon extremely poor old grass pasture-land—we may adduce the following example. The surface soil had a very light vegetable covering, mossy and almost like wild moorland. The whole extent of this grass-park was 280 acres, lying at an altitude of 400 feet, and appropriated as a public pasture for cattle. The average yearly receipts from the cattle on this pasture, for the ten years previous to the application of the lime were 126*l.*; eight years after the lime had been used, the receipts from cattle in this public pasture were 620*l.*! Again, where much iron-stone (iron-band) exists, the use of lime confers a lasting benefit, even for twenty or twenty-five years.

The high price of bones, together with increased facilities for obtaining lime by railway, has greatly contributed to the extension of the use of lime. It certainly is a great help to all seed-grasses, as well as to old turf; and where applied to light ferruginous soils, or any thin-skinned land apt to "burn" in hot dry weather, the herbage retains a rich green color. Some do not recommend its use, but this generally arises from a want of appreciation of its virtues because they have not used enough of it. Lime has the effect of sweetening the herbage. Instead of a field being overrun by fog, and yielding nothing but bent and other inferior grasses, it may be made to "eat up," and soon becomes covered with herbage of a better description. But it must ever be borne in mind that lime has no enriching qualities in itself that can promote vegetation; it operates chiefly by decomposing vegetable matter in the soil, so as to render it soluble and in a fit state to become the food of plants, and in this respect its action is both speedy and powerful. It also improves the mechanical arrangement of the soil. It will hence be seen that no *immediate* profit can or will accrue from the top-dressing of pasture-lands with lime, but as a means of *permanent* improvement it is both safe and certain in its return.

GUANO.—This is a portable manure of great value to the farmer; it is now much dearer than formerly, but so marked are the benefits resulting from its application, that it continues to be used in considerable quantities for top-dressing pasture-lands. As compared with bones and lime, it is considered to be more stimulating, but not so lasting in its effects. About 3 cwt. per acre are usually applied in early spring. February is a good time, if the weather be showery, as most likely it will be, though the months of November and December have each their advocates. The point, however, is one of much importance, for if sown in dry weather its fertilizing power is reduced by evaporation. In the autumn of of 1845 a farmer purchased, by accident, 20 tons of damaged Ichaboe guano at 3*l.* 12*s.* 6*d.* per ton, and, as it had cost but little, applied the whole upon 20 acres of pasture-land, lying in a good climate, about 40 feet above the sea. Before this application was made, the field was so poor that scarcely any thing could be kept on it; but the effect of the guano was perceptible in one week, and, in 1846, 240 sheep were well maintained and fattened on the 20 acres! Guano may be used much more freely on the land to be fed off by cattle than when the produce is to be made into hay; in such cases as much as 6 cwt. per acre may be sown. To avoid the frauds and adulteration carried on by unprincipled dealers, the safest way of purchasing guano is to buy it direct from the importers' ships, but even then it should be subject to analysis both before purchase and after delivery.

NITRATE OF SODA.—In the spring of 1852 the late Mr. Philip Pusey experimented upon the use of nitrate of soda as a "restorative for corn crops." Mr. Pusey applied the small quantity of 42 lbs. per acre, mixed with twice its weight of common salt, which latter does not act as a manure, but a corrector of the luxuriant vegetation caused by the nitrate. The result was a profit upon the outlay (6*s.* 4*d.* per acre) of full 300 per cent. Nor was this any mere garden experiment, for, with the exception of a strip left undressed, it extended over a field of 10 acres. As compared with nitrate of soda, even bones, which redeemed the Lincolnshire heaths and wolds, are not so potent a manure. At the same time, it is to be regretted that we have no well-attested experiments of its value for top-dressing pasture-lands. So far as I have used it myself, and can gather from the experience of others, it may be applied with great advantage; but in this case the salt should be omitted, and some finely-prepared soil or burnt ashes mixed with it, to assist in the distribution. The effect is both rapid and vivid, and, where immediate action is desired, it may be safely and profitably used. Taking its cost at 18*s.* per cwt., an application of 2½ cwt. per acre is soon repaid when used upon thin and scanty pastures, which in themselves, without such treatment, would be as nearly as possible valueless.

Many other varieties of manure might no doubt be advantageously used for top-dressing grass-lands, but we confine our remarks to those recommended by experience.

Composts.—For the permanent improvement of dry soils, preference must at all times be given to a "body" of manure; indeed, compounds are decidedly superior to artificial manures used singly, for though some object to the cost of mixing and subsequent cartage, yet the objection has no real foundation, since the increase in quantity more than repays the outlay. By mixing farm-yard dung, in a state of fermentation, with earth, roots weeds, banks, decayed grasses, and other plants, the whole will be brought into a state of putridity and solubility, and thus, after being turned a time or two, be in a fit condition for use. Mixing dung, in a state of fermentation, with peat, is a most successful mode of increasing the quantity of putrescent manure. The peat, when cut and partially dried, may either be carted to the farmstead and spread over the yards, as a foundation to be built upon by subsequent yard manure; or it may be mixed in alternate layers with the dung when carted into a heap; or again, the dung may be carted to the peat and mixed upon the spot. These, however, are local matters. If care be taken to watch the fermenting process, a few loads of dung may be made to rot many loads of peat—in fact, one ton of dung will usually ferment three tons of peat; but no other earths or manures should be added to this, as they may be more profitably employed. In forming *lime* composts, two bushels of unslacked lime will be sufficient for a cubic yard of earth of medium quality. The quantity of lime to be applied per acre having been first fixed upon, the mixture should be made in or as near to the field or fields as possible.

Lime and Peat compost is exceedingly valuable; in making it, just as much lime should be mixed with the peat as will reduce the fibrous matter, but no rule as to relative proportions can well be laid down, inasmuch as peaty soils vary materially, according to their age or state when used. Live peat, when dug for the purpose, should be thrown up in rows some twelve months before use, and have occasional turnings, so that the vegetable matter may be more exposed to the action of the weather. Beds of peaty soil are to be found in the valleys which have been severed from the general mass by the drainage of naturally formed underground drains. This peat is very dark in color, the fibrous matter is decomposed, and the whole substance is nearly fit for use. In fact, I have applied it, with good results, as a top-dressing upon thin hill-side land. No peat should be used or mixed for compost until it has been cut and exposed to the weather for at least six months; it then becomes less bulky, the lime has less work to perform, and the cartage is comparatively inexpensive.

Lime and Salt, in the proportion of twenty bushels of salt to 40 bushels of lime per acre, form an excellent compost for mossy lands, and may be prepared in the following order: First place lime 6 inches thick, then place a layer of salt 2 inches thick upon it; repeat this plan three times, or until it reaches the height of 2 feet; then turn and mix it, and repeat the process at intervals of ten days, at least three times, when it will be ready for use. It should be applied after the land has been severely harrowed, and then brushed in, either early in the spring or at the close of the year.

Bones, when mixed with dung or other substances, are found superior to bones when used alone. 10 bushels of bone-dust to 6 loads of dung is a fair mixture. Ashes, burnt clay, good earth, soot, or almost any thing, forms an excellent compost with bones. But while guano should be applied in wet weather, the application of bones should be made in dry weather and upon dry soils. From 15 to 20 bushels of bones per acre are used as a medium dressing; but the land, to be done well, should have a second meal in the succeeding year. Bones which have been fermented are decidedly better and more profitable than those not so treated.

Such are some of the purchasable manures for making composts; but, in addition to these, a farmer will do well to have his thoughts about him for the collection or manufacture of "home-made" composts. Let him have a "compost house," for the reception of any thing or every thing of a light nature, even from the sweepings of his court, the ash-pit, and the house-pail, to an occasional mixture of refuse from the pig-sties. This done, and a survey being made, a little bought manure may be added, turned, and subsequently applied in the second range of fields from home. The nearest, or home close, has most probably received many a similar dressing in days gone by, and has hence come to be regarded as feeding-land, not to be broken up.

The cold-lying wet Lands.—These all more or less require draining, which could be effected at a cost from 4*l.* to 5*l.* per acre, and which should be looked upon as an investment by the landlord to enhance the value of the fee-simple, the tenant paying a per centage on the outlay. As a matter of experience, such matters have now become so simple in execution, and the money may be so easily obtained from the Land Improvement Companies, that it really only wants setting about to be done well and advantageously for all concerned. The true principles of drainage, viz., to drain in depth and distance according to the position and necessities of the land, are so well understood, that I pass on to the more important matter of well considered and properly adjusted outfalls. Arterial drainage is the great desideratum of the day; and the want of it is much impeding the progress of extensive works on the yet unconquered clays and unimproved estates in the West of England. The effects of the new "Drainage Act" will, however, be to remove many difficulties, and to open up new and important works, which can now be efficiently performed, either by the landlord himself, or through the intervention of a company, charging the cost upon the land.* Much of our

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* *The New Drainage Act* (24th and 25th Victoria, c. 133).

This is a valuable Act of Parliament, by which further facilities are given for the "Drainage of Land for Agricultural Purposes."

Its provisions generally are:

1. The assignment of new limits and the granting additional powers to existing Commissioners of Sewers.

2. *The creation of "Elective Drainage Districts,"* to be managed by "Drainage Boards." A petition to the Inclosure Commissioners "of the Proprietors of not less than one tenth part n

pasture-land has been drained already; some of it effectually, some partially; but the greater part of it has not been drained at all, as was too clearly manifest in the season of 1860–'61. Pasture-lands, for some time after draining, usually wear a worse appearance and carry less stock. This is fully accounted for by the change that is taking place in the grasses. Before the land was drained, the stagnant water fed the coarse aquatic plants, to the injury, if not destruction, of the finer herbage. But, their food once removed, what happens? The coarser herbage dwindles down, and gives place to that of better quality. While in this transition state, temporary disappointment is no doubt felt, but it is only for a brief space of time; and even this may be shortened by resorting to other means, such as the immediate use of top-dressings of lime, bones, or other correcting agents. For the sake of illustration, we will suppose that a rough, cold field of land, formerly let at 10*s*. per acre, has been taken in hand, drained at a cost of 5*l*. per acre, and limed at a second outlay of 5*l*. per acre—a sum probably equal to the whole original value of the land. The money to effect these improvements may be borrowed of any of the Land, Loan, and Enfranchisement Companies, including all expenses, at 7 per cent.,* so as to redeem the outlay in 25 years, and the whole cost will be met by adding 14*s*. per acre to the rental of 10*s*., or charging 24*s*. per acre as the maximum rent. On this I would ask, where is the pasture-land that will not fetch this sum under a lease for years; or which, if let annually for summering ground, would not merely pay the interest on the improvement, but also yield a profit? Or further, where is the land, of the kind under consideration, which, by close grazing as summering land, might not be so improved, year by year, as ultimately to become good pasture-land? On every consideration of public good and private advantage, it is therefore desirable that the improvements contemplated by the Legislature in the facilities afforded to landed proprietors should be carried into effect, and, in proportion as the subject is practically understood, there is no doubt that improvements of the kind suggested will be carried out.

On the subject of Manures so much has already been said that it is only necessary to add that, in the case of large undertakings, it may be well that any heavy outlays of capital should be preceded by a few comparative experiments.

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average" of any district requiring drainage will set the inquiry machinery in motion; but the consent of two thirds of the area is necessary to the issue of a "Provisional Order" constituting a "Drainage District."

3. *Power to Private Owners to procure Outfalls.* The Act contains power to make drains or outfalls by private persons over lands of dissenting or incapacitated owners; the damage done, if any, being settled by Justices of the Peace or by arbitration: but these powers to be exercised only in cases where the damage is "of a nature to admit of being fully compensated by money."

The Act contains 83 clauses.—J. H. Cotterell.

* Under the "Private Moneys Drainage Act" it is competent for any landowner, dissatisfied with the terms of the companies, to obtain money from any available source, on the security of a first charge upon the inheritance of the improved lands.—Ed.

Bones and lime will be found best adapted for cool-lying strong soils, and liberal dressings will be found to pay best.

IRRIGATION.—Essential as the foregoing recommendations may be, attention must also be paid to the important and exceedingly interesting work of irrigation; for as the draining of valleys and marshes proceeds, so should the work of irrigation be going on; the lower slopes should be levelled, the water-carriers set out, and all put in working order beforehand, so that no washings of soil, mud or other substance be lost when the drains are being cut. On turning to nature as our guide, we find the washings of streams, rivults, water-courses, and even surface drains, dictating to us their uses when spread over the pasture-land. They seem indeed as if they were waiting and inviting the skill and enterprise of man to utilize and extend them.

The laying out of a water-meadow is but a matter of secondary consideration when compared with some general points of detail. The supply of water, its quality, its uses in an onward course for water-power and subsequent irrigation, the washing out and cleansing of yards, its concentration in ponds before use, its period of action and use—early or late, according to soil, climate or local circumstances—are each and all important elements in the art of irrigation. The outlay for making water-meadows is classed as a permanent improvement upon the estate, and may be provided for in the same way as suggested for the draining and manuring of pasture-lands. Catch-meadows on steep hill-sides are attended with great success in hilly districts, especially where the land is too steep to break and water can be cheaply obtained. By the use of a body of water alone the dry poor-land native grasses and mosses disappear; they cannot live under water any more than aquatics can live without it; and, as in the case of coarse grasses, better grasses take their place. In many districts there are thousands of acres of hill-side lands, now lying waste and producing only heather and mosses, which might be profitably brought into good cultivation by the use of capital, enterprize and good water. Landlords owning such property would do well, for their own sakes and that of the general community, to take steps for its reclamation, on the very easy terms which the recent Act of the Legislature has provided.

MOORLANDS.—These may be reclaimed for grass occupations when held in conjunction with inland estates—to which they most commonly belong, as apportioned under the "Inclosure Act"—but practical experience too often shows that the work of reclaiming large tracts of hill land in farms cannot be carried out by resident tenants having no other occupation.

It is evident that for such a bold and important work as the "reclaiming of waste lands" hitherto untouched, extraordinary encouragement in some form must be given by the landlord. When a tenant invests capital too freely, under the sanguine expectation of realizing an immediate profit, disappointment frequently ensues; and others are deterred from embarking in the work of improvement. The first tenant usually sinks his money, vacates his occupation, and a second not unfrequently succumbs to the difficulties inseparable from great vicissitudes of climate. The climate is, indeed, the great obstacle to successful moorland cultivation; an elevated position increases the uncertainty of harvesting crops and sheltering stock. The natural grasses, ever governed by altitudes, return again and again; and the only remaining hope is that liberal top-dressings of lime upon the pasture-lands may sweeten the herbage and make them "eat up." The winters are long and the summers short; so that the whole year's receipts can only be realized from the summering of stock—not crops.

Upon inland estates placed at a lower level the work is more simple and may be carried out with less risk of capital.

THE EXTENSION OF PASTURE-LANDS.—There are but few estates in Great Britain in which the farm-lands might not be increased in value by rectifying the shape and adjusting the size of fields, improving the fences, draining the soil, or adding to the means of shelter; and there are but few farmeries that may not be rendered more commodious or convenient.

As a preliminary step to any such improvements, too much importance cannot be assigned to a general map of the appropriated lands, showing the situation of the several farms and fields, together with the existing water-courses, embankments, fences, buildings, commonable lands, (if any), etc. With such a plan before him, the practical man is enabled with very little effort to grasp the whole requirements of the case, and to devise a comprehensive scheme of improvement which in the absence of methodical study would be next to impossible.

Farm-lands are of more or less value according to the means and facilities of occupying them. Arable lands in particular require buildings and other conveniences proportioned to their extent; and as it is much easier to plan and erect a new farmstead than effectually to improve an old one,—the former requiring science and ingenuity, the latter good sense and practical judgment,—we sometimes observe a prodigality of expenditure. In the rearrangement of farm buildings, as also in the consolidation of an estate—by getting the several farms into ring fences, by exchanges or otherwise—much thought and foresight are required properly to determine the proportionate quantities of arable, meadow and pasture-lands. In arriving at this result, climate and the situation of the fields must first of all be considered. In the West of England and other humid districts of England there can now be but one opinion as to the desirability of increasing the percentage of pasture-land upon every farm, more especially on the cool-lying and undulating estates, in hilly districts.

For the immediate execution or extensive improvements it is necessary to employ a steward or manager of adequate abilities and integrity, and to supply him with the requisite plans, men and money. The remodelling of an estate by means of new roads, water-courses, fences, plantations, quarries, etc., requires active measures and well-defined plans. The improvement of farm-lands, the extension of pastures, meadows, etc., are works of slower movement, but nevertheless call for prompt attention. For the latter purpose a well-laid scheme is devised, and then "worked to" from time to time until the whole is carried out, and the once rugged outlines, dirty lanes, broad hedges, bogs and swamps are brought into forcible contrast with the then remaining unimproved lands of neighboring estates!

When adjusting the proportions of arable, pasture and meadow lands, the extent of ground which a farmer occupies and the size of farms suited to the class of tenants in each particular district demand due consideration. Small occupations interfere with uniformity of outline and throw difficulties in the way of subsequent arrangement. Farms in the West of England may be divided into three classes—small farms under 100 acres, moderate sized farms from 100 to 200 acres, large farms (for the district) from 200 to 400 acres and upwards, of land fit for occupation. The small farms are usually held by working tenants, whose practice it is from the earliest stage of life to employ their families in and about the yards, fields and houses, and rarely to employ a laborer, unless to mow or thrash the corn. Still these "laboring" tenants are a commendable class; they maintain their position in a respectable way, and the more fortunate ones rise to larger holdings. But it is with the moderate sized farms we have most to do, and these are well calculated for carrying on the dairy system, for the breeding and rearing of stock, and the extension of pasture-lands. There are few trades in which a small capital can be employed to greater advantage than in a dairy and rearing farm, and yet there is no branch of agriculture where such constant and unremitting attention is required. Here it is that the wife and daughters are especially useful; they either perform or superintend the whole indoor business, and their aid is essential to render it productive or profitable.

Farms of the larger size differ considerably as to the extent of the holdings; a mountain breeding farm of 5000 acres will not require more capital to stock it than an arable mixed farm of 500 acres, and it will cost far less for labor. A similar remark is also applicable to all grazing farms, and especially to the extension of pasture, by laying down to grass such fields as are in any way doubtful for corn.

As no farming can pay without good and efficient markets, the situation of farm lands in regard to markets is a most important matter for consideration. And here it must be remarked, that while it is often both a laborious and costly process to convey the produce of arable lands to market, the produce arising from pasture-lands walks to market in the carcase of the animal, who have collected their own food, paid their own laborers, and found a ready money sale in a comparatively dear market.

The elevation of lands above the level of the sea has a material influence on the produce. In the higher districts the grain is less plump, runs more to straw, is less perfectly ripened, and the harvest is also later and more uncertain; this, however, is not the case with grass, for although the herbage is more slowly produced and less nourishing, it has the merit of being more certain in its return and not so expensive to grow. A hilly irregular surface, whether at a high or low elevation, is unfavorable to arable farming, since the labor of ploughing, carrying home the produce and carrying out manure, is greatly increased. Hill farms are also much exposed to the vicissitudes of weather; but when appropriated to stock farming, such inconveniences are not experienced.

The aspect of lands is another important subject requiring attention, more especially where the climate is unfavorable. Soils facing the south are more favorable to the growth of corn, while those facing the north produce the heaviest crops of grass. It may hence be affirmed that a mixture of arable and grass farming is, on the whole, the most convenient if not the most profitable method of farming in suitable districts; for, independently of the advantages to be derived from a system of alternate husbandry, which are always considerable, the chances of profit are more certain and numerous, where a varied system is pursued than where only one object is sought to be attained. Speaking of the West of England with its moist and variable climate, we have no hesitation in saying that the profits of farming, especially arable, are much exaggerated by people in general, and it may be asserted as a fact that no capital, except that sunk in landed property, affords less profit than that employed in farming.

*The present Grass Lands.*—In every county by far the greater proportion of the perennial grass-lands are the work of nature, and it was not until an advance stage in the progress of agriculture that attention was paid to their management. In a highly cultivated country like Britain, therefore, those lands retained in grass either are or ought to be such as are more valuable to the owners in that state than they would be in any other. Originally such lands naturally divided themselves into two classes: those which were fit either for mowing or pasture, and those which were fit for pasture only. Subsequently to these selections, other lands have been from time to time laid down in permanent pasture, proper soils and situations having been selected for their use. These again may be divided into two kinds: rich or feeding lands, and hilly or rearing pastures. Under the former we may comprehend all rich pastures capable of fattening cattle, and under the second such as are only adapted to rearing cattle or depasturing sheep.

The lands best adapted for permanent pasture are of three kinds: strong tenacious (drained) clays, which are unfit for turnips, though they improve yearly when under grass; soft clayey loams, with a clayey or marly bottom; and rich, sound, deep-soiled land, together with vale land, enriched by nature's washings from the higher levels. The advantages of such pastures are very great. The cattle fed on them realize a considerable weight; the grasses produced are of various kinds, they are not easily scorched by the summer's drought, and there is a succession of pasture throughout the whole season.

To break up lands possessing these advantages can only be justified by the most urgent public necessity. Such being the case, owners of property would do well to search their estates for soils possessing similar advantages, in order that they may form an additional part of the grass-lands upon their several farms. The increased value of such lands will best appear by comparing their rent and produce with that of stiff and unkindly arable lands. Mark the result! By adding to the good pasture-land, and by diminishing the poor arable, we can keep more stock and require fewer horses and less labor. The disparity of rents for grass and arable lands in Lincolnshire, with which I am familiar, furnishes a striking illustration of this point. On farm after farm, hundreds, nay thousands of acres together, the grass-lands are worth 3*l.* per acre, while the arable lands on the other side of the fence are valued at 40*s.* In the former case the return arises from beef, mutton, wool and Lincoln cart-horses, which are obtained year after year at a trifling expense, subject only to a little variation from the nature of the seasons. Such lands, it is evident, cannot be better employed than in feeding stock.

Hilly pastures, including such low hills as produce fine short herbage, though not altogether inaccessible to the plough, may be advantageously laid down with permanent grass, whilst some tracts, from their steepness and elevation, should be exclusively appropriated to the feeding of live stock. These pastures are, for the most part, best adapted for sheep, and, after receiving proper attention, have herbage sufficiently rich for fattening sheep and promoting the growth of breeding cattle. These selections, for additional pastures, work well together and relieve the occupation of two difficulties: the uncertainty of managing the clays when under arable culture, and the expensive and inconvenient process of tilling the hill-side lands. Many fields have been broken up from grass which ought never to have been touched—as meadows, marshes, lands apt to be overflowed, lands near towns, and low-lying tracts in the valleys and mountanious countries, particularly in the chalk districts, where meadow-land is scarce.

To adduce practical instances, of recent date, of the reclamation and improvement of wet-lying lands, I may first allude to the Fens of South Lincolnshire—a part of the great eastern plain of England—upon which large investments and ample profits have been made. That part which is termed the eastern plain or great level of the Fens, extends into the six counties of Lincoln, Cambridge, Huntingdon, Northampton, Norfolk and Suffolk, and is bounded by high lands to the west. These flat-lying lands are about 70 miles in length, and vary from 20 to 40 miles in breadth, presenting an area of nearly 700,000 acres, and being watered by six large rivers—the Welland, the Witham, the Ouse, the Nene, the Cam and the Glen. It is upon this vast extent of flat country that so much rich pasture-land has been formed, and is now letting at very high rents. These lands have been reclaimed from the sea. Originally some of them were formed of sand, others of silt, others of mixed washings and sediments, while the lower lying lands were formed of peat, arising from the waters becoming stagnant and remaining upon them. When redeemed from the ocean, they were severally acted upon by different agents; some of the lands with irregular surfaces were ploughed and levelled, and others were top-dressed with opposite mixtures of soils, such as clay, marl, etc.

The passing of the "Nene Act" in 1827, for the more effectual drainage of the Lincolnshire Fens, prove of great value. The north level and Portsand (commonly called Postland), in the parish of Crowland, where I formerly resided, contained 48,000 acres. Before the passing of this Act it was drained by windmills, which threw up the water from the farm dikes into the larger cuttings, and thus, by raising the water level at the end nearest the farm, produced an artificial fall to the sea; but since these cuttings have been deepened at the outfall end, these farms have enjoyed a natural outfall. Experience, however, quickly showed that a natural drainage during the summer months would not suit the mixed soils of silt, sand, etc.; in fact, the pastures became scorched up and thirsty. For the purpose of dampening these soils, recourse was therefore had to ponding the farm waters at different levels. On the arable lands, however, the effect of a natural drainage was entirely different: the corn became better in quality, more certain in quantity, and not so gross and flaggy as before.

As another illustration I may mention that Arthur Young, in the year 1799, thus wrote:—"Twenty years ago this land [Deeping Fen] *sold* for 3*l.* per acre; it is now worth 20*l.*" Had he been writing at the present time he might have added the still greater fact, that it now *lets* at 40*s.* per acre.

One more instance and I have done. Holland Fen, containing 22,000 acres, originally an open common, was drained and enclosed under the Black-Sluice Drainage Act in 1765. The rental *before* the enclosure was 3600*l.*, directly *after* the enclosure it let for 25,300*l.*, and it is now most fertile land. Comparisons are at all times odious, but successful instances like these may be well adduced, as affording example and encouragement to other improvers; for, though extending over thousands of acres, they tend to show the importance of paying attention even to smaller works.

While on this subject I may, perhaps, be permitted to quote the experience of my father, who, for many years, successfully farmed in South Lincolnshire. He was so well satisfied with the effect of increasing the breadth of pasture-land around his house, that he was induced to still further trench upon the arable lands. This was set about; the land was cleaned, roots were grown, and these were succeeded in the following year by rape and grass seeds to remain in permanent grass. Such was the growth of the young grasses (without corn) upon this land, that it was with some difficulty they could be kept within bounds, and as many as sixteen sheep per acre were fattening upon them for weeks. This vigor, with certain reductions, the land retained for three years, and subsequently it settled down into first-class "ox-land," which is held in such high repute. An instance of changing the character of the herbage of a field may also be mentioned. A field of about twenty-four acres had been used for fattening sheep from time immemorial, but ultimately a new arrangement of the farm suggested the importance of this field being used for cattle. The soil, it should be observed, was of a dry silty nature, resting upon a somewhat similar subsoil. The banks of the surrounding ditches had long been formed, and contained a heavier soil, part of which was of a clayey order, from the bottoms of the ditches. These banks were turned over again and again, and lastly, mixed with a good proportion of farm-yard dung. The compost thus produced was applied most heavily during the frost in winter, so thickly, indeed, that the grass could scarcely be distinguished, yet the frost pulverized the mass, and by the assistance of harrows, roller and bush, the whole was got in, and the May grasses made their appearance as before, but much darker in color. The field was now grazed with one-third its complement of sheep, and a sufficiency of second-class cattle to keep down the grass.

The next year it was grazed with fattening cattle and one fattening sheep per acre, and it has since become one of the very best fields in the neighborhood. From this it may be inferred that, whilst a mixture of different animals feed the land more evenly, a preponderance of animals of any particular class have a decided tendency to change the herbage. Sheep-grazing has the effect of calling forth the finer grasses;—cattle certainly produce strong herbage. Of the horse what shall we say? Being a bad farmer, he has no grazing friends!

My experience in the Midland Counties leads me to the conclusion that, as a rule, more profit would result from the improvement of existing pastures, and the lengthening of the period usually allotted to the artificial grasses when taken in rotation upon the arable lands, than by adding to the area of the present pasture-lands. There is already in the Midland Counties a heavy percentage of grass; the climate is favorable to the corn, and the majority of farms are well placed for markets. Still there are many ways in which existing estates might be advantageously improved and re-arranged, and these should not be overlooked. If a comparison of the relative value of grass and arable land were really wanted, it might here, in the Midlands, be fairly instituted. The average rental of the pasture-lands exceeds that of the arable by at least from ten to fifteen shillings per acre.

Somerset, Devon and Cornwall, are proverbial for grass-lands, to which the humid climate is favorable. It is in these counties that a mixed grazing and dairy occupation is found to answer well. Dairy produce and rearing—the Devon steer and grazing—are alike profitable and deserving attention.

In Somerset the proportion of grass to arable is large. Out of 1,089,099 acres, about 600,000 acres are enclosed grass-lands. At the end of the last century the common and waste lands were estimated by Mr. Billingsley at 115,000 acres. There are still in the western hilly districts some 35,000 acres uninclosed. The Inclosure Act has done well for these districts.

Mr. Roales, of Brendon Hill, was about the earliest cultivator of these lands, with a view to permanent grass. His process after roots was to seed the land down without a corn crop, and to add a second or half dressing of lime, according to the quality and position of the land. This practice has grown rapidly into favor of late, and some farmers have gone on too fast, by going over more land in a year than the pocket could afford to lime. Decided failure and disappointment have been the result. The thin soils have been plowed up again and limed properly, while the flat cool lands have been brought round by top-dressings of lime, and remain in grass.

Early habits and practices are very influential. Thus we find an Essex man making inquiry for a wheat soil, a Norfolk man for barley soils; while the men of Somerset and Devon are eager for grass and water meadows. No wonder, then, that we find the best men of the West paying attention to their pastures and meadows, and having *always* something to sell, while their yet inactive and inexperienced neighbors show a marked difference in their mode of management. No compost drill is known there is no changing of water, nor cleansing of irrigating gutters; rushes are left to tell their story out; animals return to the straw-yard to linger on through a second winter; no butcher is seen to buy their sheep; the rent is raised by a few miserable steers, and the house is kept by bartering butter and cheese for tea and sugar, while the laboring occupier and his "sons of toil" perform the work of the farm.

A leading grazier in the King's Brompton district dresses his pasture land every year, and prefers doing so to giving heavy dressings at distant periods. A compost of lime and earth is so prepared as to admit of its being distributed by a common manure-drill, and wet weather is selected, even at any season of the year, as the more favorable time for performing the work. The effect has been both striking and continuous. In my own case I have found the best results from a compost of lime and peat earth, applied in good quantity after the land has been closely fed in the autumn; or directly after the scythe, on the meadow lands. In either case it then gets well settled and incorporated with the soil, and is less liable to be damaged by the sun or drying winds. The autumn application ensures an early shoot in the spring, but any time will suit the land, if only it is well cleared of rough grasses before the application.

The oft-repeated question, "Will these dressings pay?" may be fairly answered by a practical quotation from T. D. Acland's Essay on the farming of Somerset (Journ. Royal Agr. Soc., vol. xi. p. 673–4):

"The great instance of successful practice with permanent pasture, is that of J. W. Blake, Esq., of Venne House, on Brendon Hill, marked on the Ordnance map 'Four Chimnies.' Mr. Blake, finding the soil of his estate not suited to the ripening of seed, but very favorable to the growth of grass, has been for some years engaged in its imdrovement with a view to the formation of good permanent pasture. This he has effected by draining, liming, and sowing a carefully-made selection of the most permanent grasses. In a few instances he has given a dressing of bones, or irrigated with pond water. He lets his fields annually by auction to farmers, graziers, and butchers from great distances. . . . The following arrangement of the several parcels of land on one of the farms, will probably be more satisfactory than a mere general statement:

| Acres. | Original state in 1832. | 1832. | | | | 1849. | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Net Value per Acre. | Letting to a Tenant. | | | Gross Amount paid per Acre. | | | Lettings by Auction. | | |
| | | | £ | s. | d. | £ | s. | d. | £ | s. | d. |
| 44½ | Arable, at............ | 6s. to 10s. | 16 | 2 | 0 | 1 | 18 | 0 | 84 | 5 | 0 |
| 42½ | Pasture, at........... | 3s. 6d. to 15s. | 13 | 17 | 2 | 1 | 10 | 0 | 64 | 0 | 0 |
| 7¾ | Water meadow, at..... | 17s. to 23s. | 7 | 3 | 6 | 3 | 10 | 0 | 28 | 0 | 0 |
| 94¾ | | | 37 | 2 | 0 | | | | 176 | 5 | 0 |

From the increased rental (which includes the tithes) deductions must be made for rates and taxes, as well as for the triennial dose of lime. The quantity of lime used is fifty bushels per acre, about every three years."

I must yet go further, and quote the following:

"The soil on which these improvements have been effected, all rests upon a substratum of gray slate (stone rag). The surface was in three different conditions: 1. Peat, to a depth of 5 feet, between which and the slate rock a layer of clay is interposed. 2. Old worn-out arable land. 3. Old grass-fields, and open common which had never been cultivated, but was covered with fern and short English furze."

In Mr. Dixon's Essay on "Manuring Grass Lands" (Royal Agricultural Society's Journal, vol. xix. p, 205), we find another striking and paying result from the use of bones:

"A great improvement by bone manure was effected by Captain De Hollenworth, of Hollenworth Hall, Cheshire, between the years 1840 and 1843. In those three years about 1,500*l.* was expended on bones, principally boiled, and about 4*l.* in value was used to the acre. Boiled bones at that time cost 4*l.* per ton; raw broken bones, 7*l.* per ton. . . . The character of the soil was various—some peaty, on aluminous shale or stone: other parts a lightish gray soil, on aluminous slaty stone. It was on the latter description of soil that the bones effected the greatest change. . . . The quality of the herbage was totally changed within the first two years after boning. Some of the meadow land, which had been let at 30s. per acre, was readily raised to 3*l.*, and still made more money for the tenant when turned either to the feeding and breeding of sheep or the feeding of cattle."

Further on, Mr. Dixon, when speaking of composts, bears the following testimony to the effect of lime and earth (p. 213):

"This compost acted sooner than lime alone would have done; it has been *equally*, or I might say, to some extent *more* effective. About 1,000 tons of lime have been used on these small farms, at a rate of eight or nine tons to the acre. . . . The lime costs here 12s. per ton. In one year after the lime had been applied, from 10s. to 15s. per acre advance in rent was readily obtained. . . . I find, from further observation and experience, that manure of every description—even lime and marl—is much less lasting on high lands than on lands situated at lower altitudes, the difference beginning to be perceptible at an elevation of 250 to 300 feet."

If this be so, an outlay in bones or lime of 4*l.* to 5*l.* per acre would convert a large portion of our second-rate pastures into good feeding land. Every farmer knows the advantage of having some that will fatten bullocks, and if any is to be let there are always numerous offers for it at a high rent. Surely under these circumstances it would answer the purpose of occupiers under lease to convert some of their moderate grass into land worth nearly double its original rental!

We have thus far treated of improvements that may be ventured upon by tenants: there yet remains to be mentioned the desirable plan, where practicable, of a union between landlord and tenant to develop the resources of a farm. This may be acomplished in many ways.

The landlord may find or borrow money for improvements, and the tenant pay interest; he may remodel the farm, when it comes into hand, or otherwise, and then charge a proper rent for it for a term of years: or he may go still further—take the farm in hand for a few years, and then let it with the permanent improvements made in it. Another plan is for the landlord to keep the old tenant in the farm, and to help him by finding capital for reinstating it. In such cases a mutual agreement should be drawn up, whereby landlord and tenant may each advance half way, to the benefit of both. As an instance of this good and practical fellowship, I may mention what is daily occurring under my own eye in the parish of Bray, North Devon. The late Sir Peregrine Acland introduced a plan amongst his tenantry, which has since been, and is now, adopted by the present Sir Peregrine P. Acland, viz., to give the tenants at the kiln mouth whatever lime they please to draw for the top-dressing of their permanent pasture and meadow lands, on condition that the lime so given shall be properly managed and mixed with earth in compost before applied to the land. This proposal was gladly accepted by the tenantry, it has been carried out to a considerable extent, and the practice still continues. Lands that have been let from time to time, as they have fallen into hand, have not unfrequently been doubled in value. Here, then, is a practical illustration of our subject, and an example to improving landlords. It is not only found to pay the landlord, but the tenant also; for the farms obtain a popular reputation, and when by any chance one comes into the market, there are plenty of persons ready to take it. Nor is this a solitary case: similar results have followed in other and adjacent parishes from the application of lime

There is yet another mode in which the landlord, at a very small outlay, may greatly help his tenantry. Suppose that a good tenant is disposed to seed down a field or fields for permanent grass without a corn crop—the land being efficiently cleaned, manured, and sown with roots, to be succeeded by rape and grass in the following year—a landlord may step in and give the tenant an additional quantity of manure, to be applied in the second year, as also some choice grasses, to be added to those already selected by the tenant. Thus at a small cost, in the nature of a gift or allowance to the tenant, immense good may be done, and the landlord will find his return in the enhanced value of the fee simple of the land, by its conversion into rich and permanent pasture land.

As an example of what may be effected under a liberal and spirited ownership, allusion may be made to the now very beautiful grass-land property at and around Tavistock and Milton Abbott. By the combined aid of good agents, enterprising tenants, and a liberal landlord, the once familiar small fields and numberless hedgerows upon the Bedford property have steadily and judiciously merged into respectable farms and fields. The crude and weedy culture of old —when white straw crops were the prevailing elements in a course—have disappeared before the improver, and given way to verdant and well stocked pasture lands, now of infinite credit and profit to all.

In the same district, upon the Whiteford Estate, similar improvements have been instigated, and are steadily going on. The use of bones upon this estate has proved so beneficial and commanded so much attention, that it has been fully determined by the proprietor to erect a *bone-mill* upon the estate. Thus in starting a sawing-mill by water-power, a bone-crushing mill will be attached, to be used when the sawing-machine is idle. The tenants will thus be able to purchase bones which are genuine, supplied close to their farms, and at the very lowest price. This advantage will doubtless create a great demand, which I hope may not stay at the arable land, but extend also to the pastures. At all events they will be liberally used upon the park and other grass lands now in hand The *additional* cost for the bone-mill, in conjunction with the sawing-machine, will be about 150*l.*

Mr. Langford (the bailiff) thus alludes to a new theory:

"We have a vein of soft *freestone* upon the Whiteford property, which I feel sure is rich in mineral phosphate; this stone I intend to grind up by aid of the water-wheel, and use as a top-dressing for grass on the soils resting upon the quartz or spar substratum. Experience has shown that we can readily change the herbage growing upon land, without ever sowing the seed of those grasses. Nature is ever at work; the atmosphere is ever ready to give a helping hand. Let the land be free from weeds, finely comminuted, the soil rich in mineral phosphates, and you will be certain to obtain a fine herbage. The 'clover sickness' may be fairly attributed to the absence of mineral phosphates; the land has become bankrupt through a long course of cropping."

**Estates.**—The conclusions to be drawn from the foregoing pages are: that the remodeling of estates and farms, and other permanent improvements, can be effected by the owner of the soil, the tenant paying ample interest for well-employed capital, while the contour of the estate and the appearance of the neighborhood would be so improved that the selling value of the property would be enhanced. This may be done by the landlord and tenant uniting their efforts for the purpose of mutual benefit; or lastly, if the other means fail, the improvement may be successfully and profitably effected under the powers and directions of the Land Loan and Enfranchisement Act, at a cost which is scarcely appreciable when spread over twenty-five years.

**Manures**—It is clearly shown that we have two classes of manures, and two purposes to put them to. If we want to improve the herbage and to make a lasting improvement upon pasture land, we must use *lime* or *bones*. If we wish to increase our quantity of grass for present return, and to stimulate the meadows, &c., we must use guano, nitrate of soda, soot, or other *ammoniacal* manure. In the latter case a mixture of equal weights of best Peruvian guano, nitrate of soda, and common salt, to be used in early spring at the rate of 3 or 4 cwt. per. acre, according to the condition of the land, will be found an effective dressing. If this should make the grass too strong and coarse, them lime or bones must be applied as a corrective in the succeeding year.

If proper arrangements can be made as to tenure, the safest and soundest economy is to obain an effect at once, and not by piecemeal application. An outlay of 4*l.* to 5*l.* per acre in bones or lime is found to convert second-rate pastures into good feeding land. It is also proved to be better to turn a bullock into a pasture when lean and take him out when fat, than to leave it to be done by other artificial agents in the winter—a costly process, and one that never pays. If a balance were struck between the cost of producing lean and fat meat, at per stone, under the two systems of grazing, the result would be so emphatically in favor of the latter as to furnish another proof that the "putting off" system does not pay. Indeed the increased number of stock, that improved land will carry, leave a corresponding amount of droppings behind them, both solid and liquid; a true illustration of the Lincolnshire saying—"If a beast be fed on straw, and straw only, the manure is straw, the fields become straw, the tenant straw, the landlord straw—in fact, all are straw together." On the contrary, "if a beast be richly fed," say on oilcake, "the manure is rich, the fields become rich, the tenant rich, the landlord rich—in fact, all are rich together." This certainly applies most forcibly to the rich and poor pasture lands throughout England.

When poor pastures are thoroughly bad, a great effort must be made entirely to change their character. If a field is only stunted in its herbage, stimulating manures may be applied; if coarse in its herbage, a few bones may be sown per acre, which will quickly sweeten it, especially if well soaked with liquid manure from a cattle-yard.

It thus appears that money judiciously laid out in the improvement and extension of grass land brings in a more certain return to both landlord and tenant than when extended in the growth of corn. Grass lands are by no means subject to so many vicissitudes as corn crops; the latter too frequently suffer from unfavorable seed-times, bad harvests, and severe winters, while pastures may with comparative ease be controlled and regulated. If in a growing season there is more grass than is required for the time, an additional hay-stack is never found to incommode the cattle in their winter quarters, while a "lodged crop" of corn rarely if ever recovers itself, and the farmer has no remedy at hand.

[NOTE.—I think it essential that it should not be supposed that we have only two classes of manures for grass lands. I have paid great attention to the improvement of grass land, and have made many experiments with all manures that have been suggested, and I have found that none equal *farm-yard* manure; other manures have done more or less temporary good, but none have left such enduring good as well-mixed farm-yard manure. Bones on my farm were of no use. I was warned by a Cheshire friend to try them on small portions of land, and fortunately I attended to his advice. Nitrate of soda gave me a great length of grass for hay, but the aftermath was almost worthless, and the next year's crop was less than usual. The true plan is, I believe, to try on each farm in small plots the various manures, and after proof of failure or success to work on the larger scale. I believe that no improvement on a farm is so profitable as the improvement of all the grass lands.—PORTMAN.]

# FUNGI.

The word FUNGI comprehends a whole tribe of plants belonging to the lowest type of vegetable existence. Toadstools, mushroons, the mold of bread, of cheese, of preserves, the mildew of fruits, and the rust and smut on grains, are all included in the term. So is the mother of vinegar. The yeast of bread and of beer are composed mostly of fungi. Usually they are of very rapid growth. Darkness and decay favor their production. In a single night they are often produced in great abundance. Generally they are of a soft substance, though some of them (*Lenzites betulina* and *Dædalea quercina*, which grow, the first on the birch and the latter on the oak) are firm and almost as hard as wood. Some are gelatinous, slimy, and present a very unsightly appearance; others are beautiful in color, elegant in form, and exquisitely delicate. Some are eatable, others respectively poisonous, medicinal, intoxicating and luminous. As culture has greatly improved and is still improving those plants cultivated by man; as the apple, pear and the peach originated from inferior and almost worthless sorts of these fruits; as the potato has in a few centuries been brought from a wild state to be one of our most valuable plants, so there is little doubt that some of the varieties of *fungi* can by cultivation, under proper circumstances, be brought to a high degree of perfection, and become, not only as now, a luxury for the few, but a valuable article of food for the many.

NATURE OF FUNGI.—Equally with the leaf and fruit-bearing plants, fungi are true vegetables, and the phenomena of their growth are essentially the same as of all vegetables. Though they often occur in situations least expected, and where it would seem as if their growth must depend on "spontaneous generation," yet the most careful experiments have shown that pre-existent germs are necessary to their production. Their germs are so small and so freely carried by the air, that they are not easily excluded from any position. There is nothing of chance in their appearance. The species are as distinct and as well defined as in other parts of the vegetable kingdom.

HABITATS OF FUNGI.—It is doubtful if there is any substance or situation where vegetation can be supported, that some forms of fungi do not make their appearance. Not only are they found on decaying wood or vegetable and animal substance, upon flint, on glass, in poisonous solutions in fluids not subject to decomposition, but on living animal and vegetable structures. The *Coprina* sometimes appears on the dressings of amputated limbs so suddenly that surgeons are sometimes unjustly charged by those who do not know the speed with which it passes through its changes. *Mürula paludosa* grows uniformly on vegetable matter floating in water. Oil casks and the walls of oil mills produce a mold of gigantic growth; so do casks of grease. Tan-bark partly decomposed is favorable to the growth of many species, and so are solutions of arsenic, sulphate of iron, and copper. Cellars for wine, wine casks, and the casks of wine bottles are all subject to mold. Sometimes it is produced in the cavities of potatoes and tomatoes, when the external air is excluded.

. Geographical Distribution.—Those who will take the very common dry puff ball, squeeze it tightly in the hand, and observe the millions of spores which escape into the air, each of which will produce a fungi, will not wonder at their almost universal dissemination. They are so small and light that the least breeze disseminates them in all directions. Some species are distributed in almost every part of the globe. The common mushroon is almost universally diffused. Some species are very generally diffused in regions of a similar climate. Species will not, however, become permanent inhabitants of any region where the climate is destructive to their spawn.

Growth of Fungi.—Fungi consist of two parts, the spawn or vegetative part, and the fructifying part with caps and gills, which part answers the same relation to the spawn as the flowers of other plants do to the stem. Although spawn often flourishes for a long time without producing fruit, yet fruit is never produced without spawn. The tendency of the growth of fungi is from a center, and sometimes large rings of it are formed from a single fungus which progresses outward in every direction from a center. The soil behind being made unfit for their production, they die and are succeeded by vigorous growths of grass. These rings are called "fairy rings" Spawn penetrates deeply into decaying wood in a very short time. When growing under flag stones their pressure often displaces them. Without light they do not perfect their fruit. Some fungi, as *Polyporus fraxineus*, increase in size for years, but usually their life is of short duration.

Structure of Fungi—With the exception of a few genera which contain vessels, fungi are composed entirely of cells, in form irregular oval, and cylindrical. These usually contain a granular mass. Some forms consist almost entirely of spawn; others have a predominance of the reproductive organs. Their color depends on the contents of these cells. Some species (*Agaricus oliarius*) are exceedingly luminous, so much so that letters can be distinguished by their light. Fungi are propagated by these cells, also by the spawn.

Fungi as food—Some of the fungi are so widely disseminated, growing so rapidly, and being nutritious, palatable and healthful, that they possess high claims for cultivation as an article of food. In many of the large cities of the world they are regularly found on the market, from May to October. In choosing them for food, however, those should be selected which have no poisonous qualities. Reference should be had to the locality in which they grow. If found in places where light and air have little access; if when cut across the stem they present a bluish circle; if they have a disagreeable smell, are light yellow or dark red, or feel firm and moist, they should not be chosen. The accidents which attend their use are generally the result of ignorance. Their injurious qualities depend principally on the amount of poisonous alkali they contain. Sometimes eating largely of wholesome kinds, on an empty stomach, with little mastication, produces very unpleasant symptoms. They should always be eaten with bread. Their composition is mostly albumen, fatty matter, acetic and phosphoric acid, combined to form some salt, soda, ammonia, and iron. They may be preserved for months in vinegar, or be formed into a catsup, when they make an admirable condiment. To cleanse them, place them in luke-warm water, to which has been added vinegar and salt.

Though there are doubtless many kinds of fungi in Ohio which are edible, yet we recommend only the *Agaricus campestris* and the *Morchella esculenta*. The accompanying figures of them, with botanical descriptions, will enable any one to recognize them.

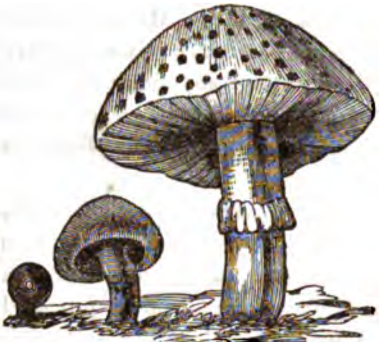

Fig. 5. Agaricus Campestris.

*Agaricus Campestris.*—Pileus fleshy, convexo plane, dry, flocculore or squamulore; stem stuffed, even, white; ring placed about the middle of the stem, somewhat torn; gills free, approximate, ventricose, sub-deliquescent; flesh-colored, then brown, very variable; found in most parts of the world. See Fig. 5.

*Marchella Esculenta.*—Pileus ovate, adnate at the base; ribs firm, anastomosing, and forming deep pits; stem even. Found in woods and gardens; esculent; varies much in breadth and heighth; sometimes conical and sometimes almost cylindrical. See Fig. 6.

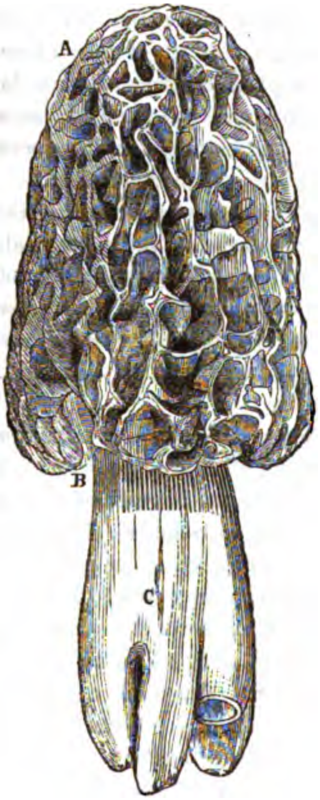

Fig. 6. Marchella Esculenta.

Fungi as a poison.—It has been previously remarked that fungi possessed poisonous qualities. Dr. J. H. Salisbury, of Newark, Ohio, in an article in the American Journal of the Medical Sciences for July, 1862, gives an account of some experiments showing the influence of the fungi of wheat straw on the human system, which point to it as the probable cause of "Camp Measles," and perhaps of measles generally. These experiments are particularly interesting at this time, and if subsequent observation should confirm the facts, the farmer may frequently take advantage of them in preventing this disease. The following extracts are taken from "Some Observations connected with Measles and the Fungi of Wheat Straw."

"Hon. J. Dille, of Newark, Ohio, came to my office on the evening of the 9th of December last, and stated that he was just recovering from what he believed to be an attack of measles. It was his opinion that he caught them from pitching straw from an old stack. He stated that on December 4th he pitched from an old stack a load of straw, and unloaded it at his stable. Portions of the stack had become partially decayed, and was steaming with the heat of incipient decomposition. In pitching over and picking out the best straw, the air was filled with a fine dust, which he freely inhaled. This dust had the odor of old straw. This took place during the forenoon. His throat soon began to feel dry and irritated. When he returned to dinner, he could still taste and smell the old straw. This taste and smell he could not get rid of. During the following night he awoke with a very sore throat, which became much worse by morning. After getting up and dressing he was taken with a severe chill, with pains in the head and back, and felt so sick and prostrated that he was compelled to return to bed again, where he remained through the day. The chill was followed by a high fever and severe pains in the head, so much so that a portion of the time he was delirious. He felt a heavy congested feeling about the chest, his throat and fauces were swollen and inflamed, with severe catarrhal symptoms. An eruption like that of measles appeared on his face and neck, and the *old straw* taste still continued. His fever continued high through the following (Thursday) night, with severe pains in the head.

"Friday, December 6th, he felt much better, and was able to be up around the house. The fever and catarrhal symptoms had partially subsided. His eyes were sensitive, watery, and inflamed.

"Saturday, December 7th, felt much better. The eruption had passed downward over the whole body, and had begun to disappear from the face. He rapidly recovered, so that on Monday, December 9th, he was moving about the streets. In the evening of the 9th he called at my office. His eyes were still red, inflamed, and sensitive; throat sore, dry, and voice hoarse, and had a heavy congested feeling still about the chest. The blotches on his face could be faintly distinguished. He stated that he could still taste the old straw in his throat.

"*Measles at Camp Sherman.*—At the military camp—Camp Sherman—Newar
Ohio, the measles first appeared on Dec. 4th, the same day that Mr. Dille expo
himself to the straw dust. From Nov. 23d to 30th, the weather was cool, dr
with considerable sleety rain and snow. During this time (there being be
six and seven hundred men in camp), many of the tents were furnished wit
which were filled with straw for the men to sleep on. In the center of e
was a fire, built in a hole in the ground, from which the smoke was led
underground flue, extending to the outside of the tent. The straw
arranged around the fire, several in a tent, and each tick accommodat
On Dec. 1st, the weather became colder, and snow fell to the depth
inch. On the 2d—which was quite warm—this melted and wet
dampened the straw ticks. Dec. 4th, the measles made their first
Camp Sherman. The men came from different parts of the cou
knew that he had been exposed to the disease. Some had
weeks, and no one supposed to have that disease had visited
quent inquiries have failed to discover any one who brough
account for their appearance from the contagion of the disea
(Dec. 4th) there were eight cases, and within a week after
disease then disappeared for ten or twelve days from its fir

the 14th and 16th the disease again made its appearance, and within a few days there were between forty and fifty cases more, when the disease ceased altogether. These last cases, occurring so near the usual time at which the disease ordinarily makes its appearance after exposure, render it probable that they were communicated from the first cases.

"On the 3d of Dec. it became warm and pleasant as growing weather in spring, and continued warm and delightful till Dec. 10th. On the 11th and 12th it was cold and freezing. The 13th and 14th cool. From 15th to 21st, warm and pleasant."

The following is the statement of Mr. S.:—

"In November, 1842, I returned home from school on Friday, when my father was threshing wheat with a machine. The wheat had been stowed away in the mow, and in a couple of stacks outside the barn. It had undergone a slight heating, and some of the straw was moldy. In threshing, the barn was filled with a fine dust, which tasted and smelled of old straw. I was on the straw stack all Friday afternoon and the whole of Saturday. About 4 P. M. I became chilly; throat and fauces became sore and swollen; a tightness and congested feeling about the chest; had severe pains through the head and shoulders, with a feeling of weariness. Following the chill, came on a high fever, with increased pains, throbbing in the head, and severe catarrhal symptoms. I do not remember of ever passing a more disagreeable night. The next day had a high fever, with increased pains in the head, back and limbs; eyes swollen and sensitive, and considerable thin unctuous secretion from the nose and fauces. Towards evening a few blotches made their appearance on my face. Next day I felt rather better; the fever and catarrhal symptoms had partially subsided, and my face and neck was completely covered with blotches. My father immediately remarked, that I had the measles. This surprised us all, as I had not been exposed to the disease, there being none in the town where I was attending school, or in the vicinity. In the course of a couple of days my whole body and limbs were covered with the eruption. The disease passed off like a case of ordinary measles, leaving no bad effects save inflammation of the mucous membrane of the eyes. This I did not get rid of till the next spring. In from seven to fourteen days all my brothers and sisters (seven in number) were in bed with the genuine measles. My oldest brother attended school with me, and returned home when I did. In my attack the disease commenced with greater violence than any of the others. The fever was higher, and there was more disturbance of the head, chest and throat."

"Bearing upon this may be mentioned the circumstance that in almost every instance where our soldiers have gone to camp, in a short time after 'Camp Measles' has made its appearance, without any previous exposure, so far as is known, to the measles. It should also be stated that their beds have usually been straw.

"At a monthly meeting of the '*Farmers' Club,*' near Newark, Ohio, last month, several of the farmers stated that it was quite common, after threshing wheat, for persons who had been exposed much to the dust, to be taken with severe chills, followed by a high fever, catarrhal symptoms, and an eruption on the face. None of them could state that any one had ever had the attack twice; nor whether they had known any cases to follow the threshing of any other kind of grain than wheat.

"It is well known among swine growers, that when they bed their hogs in straw, they are affected with an eruption in the throat, fauces, and roof of mouth, accompanied with coughing.

"*Microscopical Examination of the Fungi of Wheat and Rye Straw.*—With these observations before us, we deemed the subject one worthy of a further and more careful examination—an examination which would afford something more positive. With this view, the fungous growths of wheat straw, and the dust rising from it when disturbed, were carefully examined under the microscope. The straw used for this purpose was taken from the beds at Camp Sherman, from Mr. Dille's stable, and from stacks in the vicinity of Newark.

"We then took clean bright wheat straw, free from fungi, packed it firmly into a box about one foot square, wet it with about four ounces of cold well-water, pressed on and secured the lid, and set the box near the stove in the office, where the temperature ranged from 60° to 75° Fahr. Twenty-four hours afterwards I opened the box, and found the straw in the center of the box heated and covered with a short white mold. As the straw was stirred, a fine dust of spores and cells were disengaged and rose in the air, which, when inhaled, had the odor and taste of old straw. Examined the fungi under the microscope. The plants were in all stages of development, from those just starting to those with matured sporangia.

"Again the straw was moistened, the lid secured as before, and left for forty-eight hours. The box was then opened. Found the mold had extended wider through the mass and more completely covered the straw. Submitted the plants to a further careful examination under the microscope.

"We further varied the experiments in a variety of ways, and found that whenever the straw was exposed to a certain temperature, under the influence of darkness and moisture, fungi were rapidly developed. We also found that wheat or rye straw when stacked out or housed, unless unusually dry, undergoes a greater or less degree of heating, fermentation or decay, during which process a variety of fungi are developed, having the appearance of mold or mildew on the straw. When this straw is disturbed or agitated in any way the surrounding air becomes filled with innumerable spores and cells of the broken and comminuted fungi. The individual cells and spores are too minute to be distinguished by the naked eye. They can only be seen when many are together and the air is filled with them; then they appear like thin smoke or fine dust. Suspended in the air they are freely inhaled, tasting and smelling like old straw. This taste and smell is often quite persistent, lasting for hours. The air may be filled with them, though invisible to us; but generally their presence can be discovered by the taste and smell."

The following are the experiments of Dr. Salisbury, which go to show there is some reason for the belief that there is a connection between the mold of wheat straw and measles:

"*Inoculation of the Human System with the Spores and Cells of the Fungi of Wheat and Rye Straw*—CASE I. At 10 o'clock P. M., February 11th, 1862, I inoculated my arm with the spores and cells of the fungi of wheat straw, which I obtained by placing a straw, covered with the plants, on a plate of glass, and hitting it with a few slight taps. On removing the straw, under and both sides of it was a white cloudy band, about one-third of an inch wide, running across the glass. These spores and cells lay so thick on the glass, that, to the naked eye, they seemed to touch each other. The straw from which I obtained these cells came from a stack near this place, and was the same kind of straw as that used for beds at the camp. Under the microscope the fungi presented the same appearance, and the cells disengaged in agitating the straw were precisely similar.

"Wednesday, Feb. 12th, perfectly well. No inflammation or itching around the point of inoculation.

"13th. Slight nausea. A very slight redness and itching at inoculating point.

"14th. Got up with a feeling of lassitude and nausea, which continued all day. The redness and itching of inoculating wound increasing; had difficulty in keeping warm; chilly all day; occasional sneezing; eyes sensitive; had a peculiar feeling about the scalp, as if red pepper or mustard had been rubbed into the pores.

"Saturday, Feb. 15. Nausea and lassitude continue; occasional sneezing; flashes of heat over the whole body; itching and inflammation of the wound on the arm increasing; thoughtlessly rubbed off the scab, which was about three lines in diameter. The peculiar smarting, burning, congested sensation over the whole scalp, has increased since yesterday. It extends into the bone, with pains through the forehead and temples. A few blotches have made their appearance on the face and neck. Eyes weak and inflamed, so much so that I could not use them to read over half an hour during the evening. A heavy, oppressive feeling about the chest; mucous membrane of fauces and throat dry and irritated; feel as if I had a severe cold.

"Sunday, February 16th. Had a sensation of weariness and drowsiness, with nausea, all day. Eyes red, inflamed and sensitive; Smart so that I cannot read by gas-light. Whole scalp feels sore, with a constant congested burning sensation all through it to the bone. Arm itches; redness as large as a dime. A heavy congested feeling about the chest; have had more or less fever since Saturday morning. Throat and fauces dry and swollen, and voice harsh. Pains in back and head almost constant since Friday.

"Monday, Feb. 17th. The burning sensation of the scalp still continues. Eyes weak and inflamed; cannot use them long at a time without pain. There is still slight fever with nausea.

"Tuesday, Feb. 18th. Nausea; face feels as if it had been exposed to heat and an openfire till it had become inflamed. The peculiar burning soreness of the scalp is somewhat relieved. Catarrhal symptoms and fever less than yesterday; eyesstill se nsitive.

"Wednesday, Feb. 19th. Much better; soreness of scalp almost gone; blotches and redness of face disappeared; catarrhal symptoms and fever gone; eyes well.

"Case II. Wednesday evening, February 18th, 1862. Inoculated myself again in the same place, with the spores and cells of fungi, as before.

"Monday, March 3d. The last inoculation has produced no effect upon the system that I can discover.

"Case III. Wednesday evening, Feb. 19, 1862. Inoculated my wife, on her arm, with the spores and cells of the straw fungi, from the same group of those used in the second inoculation of my own arm on the same evening.

"Thursday, Feb. 20th. Perfectly well.

"Friday, Feb. 21st. During the day a dry constricting feeling of the throat made its appearance, and grew much worse during the following night. Voice hoarse; has felt chilly through the day, with a feeling of lassitude and drowsiness. Nausea; eat no dinner. Throat and fauces inflamed.

"Saturday, Feb. 22d. Nausea; but little appetite; severe pains through the forehead and temples; tongue considerably furred; throat feels dry and inflamed, with a disagreeable constricting feeling, as if it would close up. A tumid appearance of the fauces; voice hoarse; slight fever.

"Sunday, Feb. 23d. All through last night her throat felt as if it would close up. Rest much disturbed. In the morning throat felt better. Occasional sneezing; voice hoarse; some pain in swallowing. Stupid, weary, and inclined to sleep.

"Monday, Feb. 24th. Throat did not trouble her so much last night; still hoarse; head stopped up as if with a cold; towards night a fullness and throbbing about the head, which felt sore.

"Tuesday, Feb. 25. Had rather a restless night; head feels sore, swollen and heavy, as if with a severe cold; eyes sensative; catarrhal symptoms severe; heaviness about the chest; slight cough; considerable lassitude and drowsiness; slept from 10 A. M. till 3 P. M.; but little appetite. Had through the day occasional sensations of deafness; slight redness in spots under the skin on the face. During the evening the pains in the head were relieved, and bowels became tender and sore.

"Wednesday, Feb 26th. Had a good night's rest; head relieved; eyes still sensitive; catarrhal symptoms subsiding; chest feels easier; bowels very sore and tender to the touch. Appetite returning; redness on the arm nearly gone; slight itching yet.

"Thursday, Feb. 27th. Rapidly recovering; head and eyes feel quite well; bowels still slightly tender.

"Friday, July 28th, quite well.

"It will be seen from this case that although there was scarcely any perceptible blotches, yet the other symptoms, such as chills, followed by fever, pains in the head, catarrhal symptoms, nausea, lassi ude, etc., were all present. The disease commenced in the head, throat and fauces, and passed downward, the bowels being very sore after head, throat and chest were relieved.

"CASE IV. On Sunday, March 23d, 1862, Chas. B. Pierce, a fine healthy boy, six years of age, was exposed to measles by contact with the disease.

"March 26th, seventy-two hours after the exposure, inoculated him with the fungi of wheat straw. The fungi were grown in my office, and shaken off from the straw on plates of glass, between which the spores and cells were preserved for use. On the second day after the inoculation (March 28th), a redness appeared around the inoculating point about the size of a dime. This was preceded and accompanied by catarrhal symptoms resembling a slight cold. Did not complain. Played out of doors every day. This redness at the point of inoculation soon disappeared; the catarrhal symptoms subsided, leaving no bad effects; and on April 2d he was perfectly well. Forty-two days have passed since this boy was exposed to the disease, and there are no signs of measles yet.

"CASE V. TO IX. Mr. Bartholomew, of Newark, Ohio, has a family of seven children, ranging from three to seventeen years of age. On Wednesday morning, April 2d, Franklin Bartholomew, the next to the eldest son, broke out with measles. On Saturday evening, April 5th, three days after Franklin came down with the disease, and three days after the exposure of the entire family, I was called upon by Dr. Teller, their family physician, to go with him and inoculate the other six children and the mother, none of whom had ever had the disease. We inoculated the mother and four of the children, leaving two boys—one thirteen and the other seventeen years of age—without being inoculated. On April 14th the boy seventeen years of age, and on April 16th the one thirteen years of age, broke out with the disease. It has now been five weeks since the exposure of the mother and the four children inoculated. Although there has been three successive cases of measels in the house, none of those inoculated have had any symptoms of the disease. From twenty-four to thirty-six hours after the inoculation they all had symptoms, resembling a slight cold, with a little chilliness, catarrhal symptoms and sneezing. Beyond this they have been perfectly well from the date of the inoculation to the time of this writing, May 5th.

"The inoculation does not produce a pustule and scab, like the vaccine virus, but simply a redness around the wound, like a measle blotch. There is seldom any soreness, but usually a simple itching sensation for two or three days, extending generally from the second or third to the fifth or sixth day after the inoculation.

"CASES X. TO XIII. April 12th, inoculated with rye straw fungus Mrs. ——— and two of her children, none of whom had ever had measles, and who had been exposed to the contagion of the disease from a case of genuine measles in the family, which broke out April 6th. On the evening of the 13th and morning of the 14th, they all had symptoms of chilliness, followed by fever, catarrhal symptoms, slight cough and sneezing. The inoculating wound became red over a surface about the size of a dime, presenting the appearance of a measle blotch.

"Their symptoms were so slight that the children were not kept in-doors, and the mother was not prevented from attending to her ordinary duties.

"On the 18th they had all quite recovered. It is now four weeks since the exposure, and no signs of measles in any of the cases inoculated.

"From the inoculations as far as they have gone, in from twenty-four to seventy-two hours, the effects begin to show themselves in lassitude, chilliness, catarrhal symptoms, and pains through the forehead and temples. It is highly desirable that these experiments should be extended farther. For this reason we publish thus early our observations and experiments (much more limited than we could have desired, on account of the difficulty in this place of obtaining subjects who are willing to sacrifice a few hours' health to such purposes), that others in larger places, who have greater facilities in the way of hospitals, &c., for carrying out more extended series of experiments under the eye of the attending physicians, may take up the matter and aid in its further investigation.

"I have not been able to distinguish, thus far, any difference between the eruption and attendant symptoms of genuine measles and 'camp measles,' or straw measles. When the disease is communicated to the human subject, however, by inhaling the spores and cells of straw fungi, the eruption appears to follow the exposure or inhalation in from twenty-four to ninety-six hours, while in exposures to the contagion of the disease, the eruption does not usually make its appearance until from eleven to fourteen days thereafter. It is stated that in inoculations made by using matter obtained from the measle blotch, or by using the tears, blood, or salivary secretions of subjects broken out with the disease, the modified type of measles which results makes its appearance generally on the sixth or seventh day after the inoculation. In inoculating, however, with the spores and cel
of straw fungi, the symptoms commence usually in about twenty-four hor
though sometimes they do not make their appearance till as late as seventy
hours thereafter.

"This matter, however, requires further investigation before fully reliabl
ments can be made.

"To what extent inoculation with straw fungi may prove effectual in p
the human system from the contagion of measles, remains to be seen."

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PARASITIC FUNGI.—The following, on *parasitic fungi*, is from a lec
in Norwich, England, by Rev. Edward Sydney:

"The epithet 'parasitic,' applied to a plant, means that it liv
that on which it grows. A fungus is a cellular plant without
air and nourished through a *stalk*, *stem*, or *spawn*, called i
propagated by minute seeds or spores, or sporules, either c
never green, and occasionally inclosed in skinny covering
spore-cases. Fungi live by imbibing juices impregnated w
ples of the matrix on which they grow. The spores mos
protrusion of the inner membrane, or by a lengthening o
the spawn is the development of these spores, or of itse
sessing the power of imbibing the juices just alluded

ample is common mushroom spawn, which the little seeds will sometimes throw out on strips of grass, so as to be well observed. *Fungals* most commonly grow upon animal or vegetable substances in a state of decay; but many, of the simplest organization, attack tissues in which its commencement is at least not ascertainable, or, if commencing, hasten it beyond recovery. The simplest form of fungus is common moldiness, which has two types. The first, as may be seen by the aid of the microscope, is composed of jointed threads made up of simple cells, placed end to end, which separate and seem capable of reproduction. This is represented in Fig. 7, where the cells may be seen placed as described.

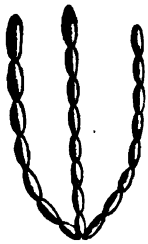

Fig 7. Showing jointed threads of common moldiness.

"These cells are capable of being separated, and appear to be reproductive. The second assumes a thread-like appearance, bearing spores on the tips of the threads, or on short processes, and sometimes in cases, by the rupture of which they are dispersed. The actual forms of these simplest fungals are exceedingly interesting. In the higher state, fungi take a determinate figure, formed of a mass of cellular tissue, the center of which is all spores, attached to it often in fours. This at length dries up, and leaves only the dusty spores, as in the case of the common puff-ball. The most completely-formed fungi have two distinct surfaces, one of which is even without any opening, the other separated into plates, called the *hymenium* or *gills*, to which the spores are attached, generally four together. Upon these differences of structure depend those various attempts at botanical arrangement. So numerous are the seeds, spores, or sporules of fungi, that it is not easy to conceive a place whence they are excluded. Those which grow on matter in which decomposition has begun, have been well called the 'scavengers of nature;' but others apparently attack tissues in full health and vigor.

"I now propose, first, to describe the parasitic fungi which injure the corn and grasses of this country, premising that corn-plants are only grasses, the seeds of which are sufficiently large for our food. These little pests usually present themselves to the eye under the form of masses of dust, differently colored, and appear on all parts of the plants except the roots. The stems or straw of our corn-plants, and also the leaves, are frequently disfigured by a dark series of patches constituting true mildew, and called by botanists *puccinia*, from a Greek word which means *thickly*, because of the dense masses of which it consists. It is found on reed as well as corn, but the microscope reveals a slight difference in the structure of the spores, by which the *puccinia* of one plant is distinguished from that of another. This parasite robs the living plant of its juices, and must not be confounded with a very minute fungus called *dipazea*, which is peculiar to the joints of the straw; nor with another black fungus which gives a dingy aspect to whole fields towards harvest, and is often called mildew, but which never attacks a plant not previously diseased, and which, for want of a better name, I am obliged to announce it by its botanical one, *Cladosporium herbarium* the character of its growth being totally unlike mildew. It grows on old leather as well as on wheat. Whatever tends to preserve the health of wheat will prevent also the attacks of this fungus.

"Fungi of a very different kind follow the British farmer into his dairy and interfere with his household economy. *Pencillium* and *aspergill* are two terms applied to some of them, because in their microscopic appearance they resemble sprinkling-brushes. Fig. 8 represents the pencillium highly magnified.

"Pencillium is the mold of hay, and is found on bread, and also on the inside of casks; and there is reason to believe its spores poisonous, for two coopers who entered a great tun covered with this mold, to clean it, inhaled them, and were seized with violent pains in the head, giddiness and vomiting, which only yielded to severe medical treatment.

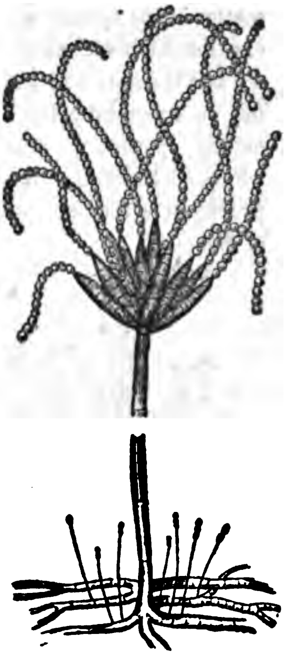

FIG. 8. PENCILLIUM.

"A pencillium is the mold of milk, and we have in Fig. 9 a magnified development of it. The pencillium may here be seen developing itself from the mass of the mold. If these molds appear much in the dairy, or on the bread kept in it, the best remedy is washing the walls with chloride of lime, which is important to know, as milk often suffers greatly in this way. Foreign badly-made cheese has an unpleasant mold, in brilliant scarlet patches; but in England the principal one on cheese is an innocent mold called *torula*, from torus, a bed, from its coming in layers. I may here observe that the vinegar plant, as it is called, is in its advanced stage a pencillium; and the beer fungus has been called torula; but before we decide the latter we must see a regular fructification in air. There are hundreds of non-productive spawns for want of air and light, as for example, the strange forms which diffuse themselves in cellars, which are incomplete developments.

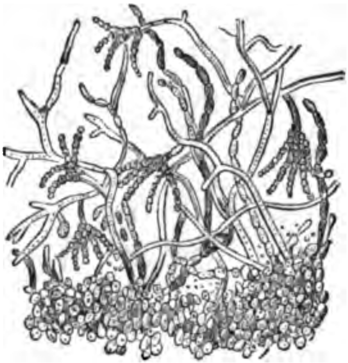

FIG. 9. PENCILLIUM OF MILK.

The fungi on stored fruit are a *torula*, a *pencillium*, common fruit *mucor*, and a mould like the first stage of the *erepiphe*. Hearting asserts that he has actually propagated the potato disease from the brown matter in mouldy apples and pears; and it is remarkable that some injurious experiments of Mr. Berkeley, on the growth of *bunt* lead, to show that its propagation may arise from mere grumous matter in the spores, which proves that many of our theories are immature. The experiments were made thus:—Wheat seeds were immersed in a mixture of water and the spores of *bunt*. The wheat was sown and the plants came up infected; but no communication could be traced between the cells and the shoots thrown out by spores; no intrusion of any mycelium developed by the spores into the wheat could be discovered. The inference is that the fine contents of the spores propagate a fungus; but this is quite opposed to our general idea of the growth of fungals.

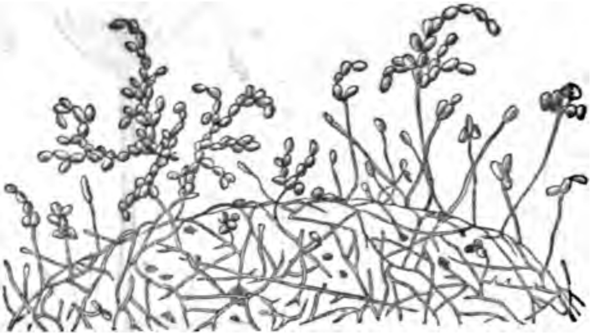

Fig. 10. Magnified view of the grape oidium.

"Figs. 10 and 11 are highly magnified views of the *oidium*. The mildew which appears on the grape and the gooseberry are but varieties of the *oidium*.

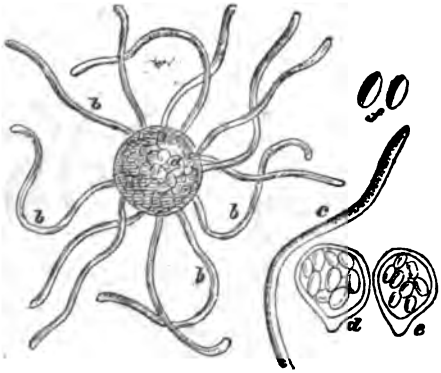

Fig. 11. Magnified view of a species of oidium.

"Generation in Fungi.—Dr. Carpenter says: 'Our knowledge of the generative process in fungi is nearly on the same grade as our acquaintance with this function in the lichens. For, although the reproductive apparatus of the fungi is so extraordinarily developed as to constitute the great bulk of the ostensible plant, yet it is only of late that any evidence has been afforded by the researches of M. Tulasne of the existence of distinct sexes in this group. By the examination of a large number of species belonging to different orders he has ascertained that the presence of bodies resembling the *epermatia* of lichens is probably universal in the organs of fructification at an early period of their development. These bodies are budded off from ramifying filaments which are sometimes developed in the midst of those that bear the 'spores,' and are sometimes found in other parts of the plant, being occasionally included within distinct concepticles of spermagonia, as in lichens. The ordinary mode in which the spores are developed is within prolongations from certain cells called *basidia*, which may be either borne on long filamentous stalks, as in tremella, or may be more compactly clustered together in the substance of a membrance. These basidia themselves put forth extensions, commonly four in number, which sometimes attains a considerable length; according to Schleiden, that the spores developed as 'free cells,' which afterwards became detached by the rupture of the basidial filaments—with a great degree of constancy in these essential features of the structure of the generative apparatus, this class presents an immense variety of forms of the organs which contain the spores. The highest type is generally considered to be that of the *Hymenomycetous* group, of which Agarics are characteristic examples. In these, when the fructification is fully developed, we see a dome-shaped body, termed the pileus, surmounted upon a *stipes* or stem, which rises from the mycelium, that constitutes the nutritive portion of the fabric. The pileus is composed of two membranes, of which the upper and outer one is simple and sterile, like the cortical layer of the lichens; whilst the inner and lower, which is termed *hymenium*, contains the basidia. The surface of this membrane is usually extended by duplication or involution; thus, in the Agarics, it forms vertical plates termed *lamella* or gills, which radiate from the stripes towards the circumference of the pileus; in Boletus and Polyparus it lines a mass of vertical tubes arranged like the cells of a honey-comb; and in Hyanum it covers the exterior of a similarly arranged series of solid columns. Of the time at which the act of fecundation is performed, and of the mode in which it is effected, we have as yet no knowledge. It has long been known that from the same *mycelium* very different forms of fructification might be evolved; and it has been recently shown by M. Tulasne, who has added greatly to our knowledge of these, that even the *casporea* (which, on account of their bearing distinct spore-cases or thecæ resembling the asci of lichens, have been regarded as a very distinct group, and have been even referred by Schleiden to the class of lichens,) are *basidiosporous* at one period of their evolution. It may be reasonably suspected that some of these forms of fructification are rather destined for the multiplication of the plant by *gemma* than for the evolution of true generative products."

THE SIMPLEST KINDS OF FUNGI.—In the simplest forms of fungi, we again return to the lowest type of vegetable existence, namely, the simple cell; and such, if perfect plants, would properly take rank among the lowest protophytes. But there is good reason for regarding many—perhaps all—of those which *seem* most simple, as the imperfectly-developed states of other plants, which, if they attained their full evolution, would present a much more complex structure. This is the case, for example, with the *Forula cerevisia*, or yeast-plant, which so abounds in yeast that this substance may be said to be almost entirely made up of it. When a small quantity of yeast is placed under the microscope and is magnified 300 or 400 diameters, it is found to be full of globules, which are clearly cells; and these cells vegetate when placed in a fermentable fluid containing some form of albuminous matter in addition to sugar, in the manner represented in Fig. 12. Each cell

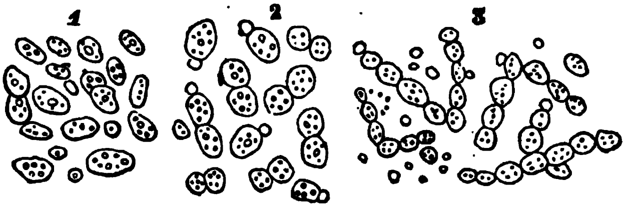

FIG. 12. Forula cerevisæ, or yeast-plant, as developed during the process of fermentation; 1, 2, 3, successive stages of gill multiplication.

puts forth one or two projections, which seem to be young cells developed as buds or offsets from their predecessors; these, in the course of a short time, become complete cells, and again perform the same process; and in a similar manner the single cells of yeast develop themselves, in the course of a few hours, into rows of four, five or six, which remain in continuity with each other whilst the plant is growing, but which separate if the fermenting process is checked, and return again to the isolated condition of those which originally constituted the yeast. Thus it is that the quantity of yeast first introduced into the fermentable fluid, is multiplied six times or more during the changes through which it takes part. The full development of the plant, however, and the evolution of its apparatus of fructification, only occur when the fermenting process is allowed to go on without check; and it seems capable of producing a considerable variety of forms, whose precise relationship to each other has not yet been made clear. In fact, with regard to the fungi generally, it has been made apparent by recent observation that different individuals of the same species may not only develop themselves according to a great number of very dissimilar modes of growth, but that they may even bear very dissimilar types of fructification; and further, that even the same individual may put forth at different periods of its life those two kinds of fructification —the *busidio-sporous*, in which the spores are developed by out-growth from free points (busidia), and the *theca-sporous*, in which they are developed in the interior of cases—which had been considered as separately characterizing the two principal groups into which the class is primarily divided.—(CARPENTER.)

BEAUTY OF MICROSCOPIC FUNGI.—There are scarcely any microscopic objects more beautiful than some of those forms of "mold" or "mildew" which are so commonly found growing on the surface of jams and other preserves; especially when they are viewed with a low magnifying power, by reflected light. For they present themselves as a forest of stems and branches of extremely varied and elegant forms (Fig. 13), loaded with fruit of singular delicacy of conformation, all glistening darkly on a dark ground. In removing a portion of the "mold" from the surface whereon it grows, for the purpose of microscopic examination, it is desirable to disturb it no more than can be helped, in order that it may be seen as nearly as possible in its natural condition; and it is therefore preferable to take up a portion of the membrane-like substance whereon it usually rests, which is, in fact, a *mycelium* composed of interlacing filaments of the vegetative part of the plant, the stems and branches being a reproductive portion. The universality of the appearance of the simpler forms of fungi upon all spots favorable to their development, has given rise to the belief that they are spontaneously produced by decaying substances; but there is no occasion for this mode of accounting for it, since the extraordinary means adopted by nature for the production and diffusion of the germs of these plants adequately suffice to explain the facts of the case

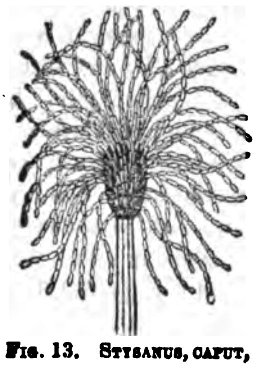

FIG. 13. STYSANUS, CAPUT, MEDUSÆ.

The number of sporules which any one fungus may develop is almost incalculable; a single individual of the puff-ball tribe has been computed to send forth no fewer than ten millions. And their minuteness is such that they are scattered through the air in the condition of the finest possible dust; so that it is difficult to conceive of a place where they should be excluded. This mode of explanation has received further confirmation from facts recently ascertained in regard to the great number of forms under which a single germ may develop itself; the particular form being ascertained, it would seem likely, by the soil whereon each germ happens to grow. Hence we are not obliged to suppose that distinct germs are floating about in the atmosphere for all the forms of fungous vegetation which appear to be of different species and which are only found in particular situations—the *Pracina rosa*, for example, only on rose bushes; the *Isaria felina* only upon the dung of cats, deposited in humid and obscure situations; and *Onygena exigua* upon the hoofs of dead horses;—but are warranted in believing that the real variety of germs is comparatively small, and that the facts just stated, with others of the same order, only indicate the modifying influence of the circumstances under which they are developed.

INJURIOUS FUNGI.—The parasitic fungi which infest some of the vegetables most important to man, as furnishing his staple articles of food, constitute a group of special interest to the microscopist; of which a few of the chief examples may here be noticed. The mildew which is often found attacking the straw of wheat shows itself externally in the form of circular clusters of pear-shaped spore-cases, each containing two compartments filled with sporules; these arise from a filamentous tissue constituting the *mycelium*, the threads of which interweave themselves with the tissue of the straw, and they generally make their way to the surface through the "stomata," or breathing-pores, of the epidermis. The rust which makes its appearance on the leaves and chaff-scales of wheat has a fructification that seems essentially distinct from that just described, consisting of oval spore-cases that grow without any regularity of arrangement from the threads of the mycelium; and hence it has been considered to belong to a different genus and species, *Uredo rubigo*. But, from the observations of Prof. Henslow, it seems certain that the "rust" is only an earlier form of the "mildew," the one form being capable of development into the other, and the fructification characteristic of the two supposed genera having been evolved on one and the same individual. Another reputed species of uredo (*U. segetum*) it is, which, when it attacks the flower of the wheat, reducing the ear to black masses of sooty powder, is known by the name of smut, or "dust-brand." The corn grains are entirely replaced by aggregations of spores; and these being of extreme minuteness, they are very easily and very extensively diffused. The "bunt" or stinking rust is another species of uredo (*U. fœtida*), which is chiefly distinguished by its disgusting odor. The prevalence of these blights to any considerable extent seems generally traceable to some season unfavorable to the healthy development of the wheat plant; but they often make their appearance in particular localities, through careless cultivation, or want of due precaution in the selection of seed. It may be considered as certain that an admixture of the spores of any of these fungi with the grains will endanger the plants raised from them; but it is equally certain that the fungi have little tendency to develop themselves in plants which are vegetating with perfect healthfulness. The wide prevalence of such blights in bad seasons is not difficult to account for, if it is true (as, according to the observation of Mr. John Marshall, a few years since, rendered probable) that there are really very few wheat grains near the points of which a few sporules of fungi may not be found entangled among their minute hairs; and it may be fairly surmised that these sporules remain dormant, unless an unfavorable season should favor their development by inducing an unhealthy condition of the wheat-plant. The same general doctrine probably applies to the *Botrytis*, which from 1847 to the present time has had a large share in producing the "potato disease;" and to the *Oidium* (see Fig. 11), which has a like relation to the vine disease that has been extending itself for years past through the south of Europe. There seems no doubt that in the fully developed disease the fungus is always present, and that its growth and multiplication have a large share in the increase and extension of the disorder, just as the growth of the yeast-plant excites and accelerates fermentation, and its reproduction enables this action to be indefinitely extended through its instrumentality. But just as the yeast-plant will not vegetate save in a fermentable fluid—that is, in a solution which, in addition to sugar, contains some decomposable albuminous matter—so does it seem probable, on a consideration of all the phenomena of the potato and vine diseases, that neither the botrytis of the one, nor the oidium of the other, will vegetate in perfectly healthy plants, but that a disordered condition, induced either by forcing, and therefore unnatural symptoms of cultivation, or by unfavorable seasons, or by a combination of both, is necessary to a predisposing condition.

# ON THE CULTURE OF THE MUSHROOM.

Mr. Vorz, Court Gardener at Sans Souci, says:

"For forty years I have been engaged in the culture of the mushrooms, both in cellars, sheds and hothouses. During this time I have made many experiments and observations, which have resulted in the adoption of the method herein described. Without venturing to proclaim this method superior to all, I may at least say that by it I have always succeeded in raising mushrooms in sufficient quantity and of superior quality.

"In the month of May I bring a load of horse-dung which is free from straw into a cellar or shed, where there is no current of air. It is there turned daily for twelve or fourteen days with the dung-fork, that fermentation may not take place nor heat be developed. It is then placed in wooden boxes about one foot deep, when it is stamped down firmly with the feet or a wooden rammer. It is then covered to the depth of one inch with good light soil. If this soil in two or three weeks becomes so dry as to crumble under the fingers, it should be moderately watered. Care should be taken, however, not to make it too wet, or the dung beneath will ferment, destroying the young fibres. The watering may be again repeated in about three weeks; but not the third time, unless it should be very dry.

"In three or four, sometimes five months, according to the quality of the soil, this mushroom-brood, with its seed-fibres, is fully developed, which may be known by the multitude of the fibres and their yellow tinge. This bed will furnish fibres for the beds in which they are to perfect their growth.

"These second beds may be placed upon the bare ground in hothouses, under the tiers for plants, where they will be best protected from sun and air. The boxes in which they are made may be movable or immovable. They should be about a foot and a half high, of optional width and length, and are covered with a closely fitting cover of movable boards. These boxes are filled with dung to three or four inches above the top; this is then pressed firmly down to four or five inches below the brim. It is left in this condition for six or eight days, till the first fermentation is over. After that the brood already prepared in the first bed is spread over it to a depth of three or four inches or more, if the brood is of inferior quality. Over this is spread good soil to the depth of three inches, and well leveled.

"In three or four weeks it will be noticed that small white fibres are being developed, and even small mushrooms, which in the course of six or eight days more will be grown to the size of a silver dollar. They should not be allowed to stand longer, because the pileus then assumes a brown color, the stem becomes hard, begins to die, and is then attacked by a small yellow worm.

"In order to have fresh mushrooms at all times, such beds must be made every six or eight weeks. During the winter they should be inaccessible to frost, and in summer in cool sheds, cellars or hotbeds.

"During summer, if the heat be great, it is sometimes necessary to water the plants; but this must be done with great care, for if the dung becomes wet, the whole crop will be destroyed by fermentation.

"In all hothouses, cellars and sheds, where there is old or decaying wood, wood-lice are found in great numbers. These destroy the mushrooms, attacking the pileus and stalk. To prevent this, a careful search should be made every evening, and where young mushrooms make their appearance, they should be covered with earth about half an inch deep, which will not only prevent the attacks of wood-lice, but contribute to the whiteness, size and growth of the mushrooms.

"The wood-lice may be destroyed as follows: Place wet tow, marrow-bones open at one end, upon the bed. Under these substances the animals will retreat, and may thus be taken and destroyed in great numbers.

"During the many years of my engagement in this branch of culture, a phenomenon which I have never seen mentioned by any writer came to my observation, namely, in heavy thunder-showers the mushrooms, whether young or old, covered or exposed, will suddenly wither and become somewhat discolored, and die in the course of eighteen or twenty hours. In from five to eight days a second growth will appear. This effect is also seen on wild mushrooms and fungi. I think that the effect of thunder is more marked when it occurs during the night than during the day. This subject should be further investigated by physiologists."

## METHODS FOR RAISING MUSHROOMS IN ALL SEASONS, PRACTICED IN ENGLAND AND FRANCE.

BY MR. G. A. FINTELMAN, COURT GARDENER.

FRANCE.—First as to the brood. In the vicinity of Paris the *loose* brood is mostly in use. This is obtained by no peculiar preparations, but is always found in old beds, often of so good quality and in so great quantity that sometimes it may be sold or preserved in case of failure.

In England this brood is less successful, because the beds are kept more moist in England than in France. We shall have occasion to speak more fully of this when speaking of the methods in use in England.

The fresh dung is packed up as uniformly as possible in heaps of three or three and a half feet high, and well beaten down with the fork. The dung of the top of the heap is thoroughly mixed with half dry dung, which has already begun to rot, to a depth of about six inches. As soon as the heat of the bed begins to decrease, the loose brood, well mixed with short dung in equal parts, is spread over to the depth of not more than six inches. The bed is then leveled and pressed, and again covered with dung earth to the depth of one inch. If the bed becomes dry, it should be watered.

If the heaps just described be prepared in April and June, and covered with straw or mats, the supply of mushrooms will be sufficient for summer and fall—from the latter part of May to October it will be most abundant; the mushrooms are taken off small, and are of very fine taste. Beneath a thicker cover, beds prepared later may be made to produce throughout the winter. They are also raised in dark places, protected from cold, from October to May.

In Holland and England mushroom-houses are not uncommon, though I have never seen them here. The construction of these houses seldom allows the beds to be built high, but they are well beaten down till they are one foot deep. The brood is not put on till the heat begins to decrease. To allow more freely the escape of heat, holes are made in the bed with a stick. Over the brood rich earth is spread one inch in depth. The crop is begun to be gathered in from four to six weeks. In the open air the beds are made two feet high, and well protected from sun and rain.

ENGLAND.—The yield in England is larger in number and weight than in France. As far as I have seen, the full-grown mushrooms were larger in England, but only once have I found them as fine-flavored as in France, and these were grown by the following simple method at Dalkeith, near Edinburgh, where I was assured by the gardener, Mr. McDonald, that he gathered mushrooms in the open air throughout the year.

In a shady spot the beds are made. They are made of loose brood, old dung and fresh dung, thoroughly mixed. The heaps, pressed down lightly, are two feet high, and three and a half feet wide below. In Great Britain the opinion is prevalent that the so-called tile brood is much better than the loose brood, and therefore the former is used here to increase the germination of the mushrooms, or, as it is said, to impregnate the loose brood. For this purpose pieces of tile brood six to eight inches in size are pressed into the beds upon which the loose brood has been spread. These beds are then covered with straw, and afterwards well protected with light boards. I examined these beds freely, and though it was raining at the time, and the ground was saturated, the beds were in a very good condition, and covered with small, very fine-flavored mushrooms. In six weeks from the time they are made these beds begin to yield, and, with proper care, they will continue to yield throughout the year.

For open-air culture throughout the year the following method is in use in England: Dung which has lain in heaps for some time is made into beds about one foot high. On this is spread loam to the depth of one inch. On this double layer is put a second similar one, and even a third or fourth. But on the last layer no loam is spread. The whole is well beaten down, layer by layer, and covered with straw. In a week or so the straw is taken off, and the tile brood pressed in as above directed, and a very thin layer of earth spread evenly over, and the cover of straw replaced. A light or heavy cover is required, as the temperature is warm or cold.

The following method of raising mushrooms throughout the year is not generally known: The brood tiles are made of horse and cow dung, mixed with a smaller quantity of earth. Fresh manure is gathered from the stables two or three times a week, and spread upon the floor in a dark place, where they remain for one or two years. They should be examined every day, moistened very little when very dry, and when mould is discovered it should be entirely removed immediately. This may remain so until the time for preparing the beds. The beds which I examined, and found to be covered densely with mushrooms, are placed on boards, one above the other; they are about three feet wide, sloping toward the front. The manure, which has lain for some time, is beaten down till it is from five to six inches deep at the wall, and from three to four inches deep in front. On this fresh stable manure is laid several inches deep, in which the tile brood is placed, at distances of nine inches; over this is spread a layer of loam one inch deep. Covers are then carefully spread over the beds, and held down by poles laid over them lengthwise. Great attention is paid to the proper moisture, and it is for the purpose of draining off all superfluous moisture that the beds are made sloping. In watering, lukewarm water is used.

Besides the above method, another is in frequent use, which costs no more labor, and is less liable to failure. Fresh stable manure is mixed with straw litter of about one-third its mass, and this again mixed with one-fourth its weight of loam. This mixture is spread upon the bed, which is made as indicated in the methods preceding the last, to the depth of three fingers, and the whole is beaten down to a depth of eight inches. After a few days, the mass becoming warm, is again beaten. To prevent fermentation from too much moisture and heat, holes are perforated in several spots with a stick of some size. After the heat has abated, these holes are filled with tile brood or loam. The whole is then covered with a thin layer of loam, as above described. The crop begins to be fit for use in about four weeks. A slight slope to the boards upon which the beds rest would no doubt facilitate the drainage. These beds are only found in closed places, where the temperature may be kept constantly at 50 to 52 deg. Fahrenheit.

All the various methods which I observed in England and France may be included in those described above, though various trifling differences were observed, which were occasioned by climate and locality.

Which of these methods is preferable, I am unable to decide, and it can only be decided by comparative experiment made in the same place and at the same time. If I were permitted to judge from single observations, I should say that the first two methods described as in use in England were the best; the first on account of the quality, and the second on account of the quantity of the mushrooms. The others appear to be in more general use.

Theory will perhaps determine this question sooner than experiment. The ancient views that mushrooms were built by animals, as corals are, or that they are only so-called crystalline emanations from decaying vegetable matter, have been entirely abandoned since the discovery and demonstration of their organic structure, and a virility similar to that of plants of higher order could no longer be denied. Micheli suggested that they were propagated by seeds, and immediately these were supposed to be floating in the air. Hedwig described the seeds which he pretended to have found, and also the impregnating male organs, though he failed to describe the female organs. Hedwig's seeds have been called germ grains, but propagation by them has not succeeded.

From known facts we deduce the following, in order to give an explanation of the process applied in raising mushrooms. The mushroom appears to be the product of two elements of vegetation—the brood and the mushroom; the latter without power to propagate itself by itself; the former producing—probably by elongation—a necessrry foundation for the formation of the mushroom, and producing it only under very favorable circumstances. The growth of the brood depends upon an increased degree of heat and moisture, which increase is not yet determined by measurement; +9° R. are known to be proper and sufficient, so far as heat is concerned, but moisture and heat should be in a given relative proportion, not yet determined. At +9° R. a degree of moisture may be injurious, which at +12° R. would be proper and even necessary. The hydrogen exhaled by mushrooms suggests a decomposition of water and a consumption of oxygen, and thus the necessity of an increased moisture for the production of mushrooms from the dry brood is explained. The exhalation of hydrogen furnishes an indirect explanation why mushrooms are grown better on stable manure from grain fodder than from that of any other kind of fodder. The principal elements of the mushroom are saccharine matter and parenchyma. The starch of the grains, barely decomposed by the action of digestion, is by fermentation with nitrogen and water, again changed to parenchyma, which, perhaps, becomes the first foundation of the mushroom, and which, as is the case with all vegetables, derives all other necessary elements from its surroundings. This parenchyma is changed into saccharine substance by oxydation, and thus we find the oxygen from the decomposed water entering into combination, while the hydrogen is evolved free or in connection with carbon. Fermentation of manure produces ammonia, and if produced to a very considerable extent vegetable life is destroyed. For this reason, we have directed that the beds should be so managed as to prevent fermentation. And it is plain that the plants will thrive best when the elements which they require are in the proper proportion—an excess of one element will operate to disadvantage with the other, and a want, whether arising from the elements being appropriated or changed by heat, air, moisture or mold, will of course cause only a partial and incomplete development of the plants. The brood appears to be an organic texture of fibres, for whose growth the same elements are necessary as in fungi, and which apparently stand in the same relation to the mushroom as the plant to the flower, or the root to the stem.

## THE INTERNAL STRUCTURE OF THE EDIBLE MUSHROOM.—*Agaricus Campestris, L.*

It is necessary to speak of the internal structure of the mushroom, because every thing said of its cultivation is unintelligible without a knowledge of this.

The mushroom grows from a substance which very much resembles mold. It consists of small branching fibres or tubes, which are divided into cells by partitions or cross walls, distinctly visible under the microscope. The botanists call this portion the mushroom "thallus," and compare it to the base of the lichens. Linnæus said, that in these vegetables, root, stem and leaves are blended together; and the more this imperfect vegetation is observed, the more apparent becomes the truth of this observation. They are greatly in error who consider the so-called mushroom to be the whole plant. The organised parenchyma is an essential part, and a mushroom cannot exist except it is formed from this. What is generally called the mushroom is nothing but the fruit-bearing portion, which is provided with a stem, and grows to an extraordinary size in proportion to the whole plant. This *thallus* is called brood in the preceding essays. There can be no doubt but that the mushroom is reproduced as many other plants are produced—by division, so long as there is life in the divided parts; and at the same time, there can be no doubt but that they are produced by the regular method by means of seeds.

On this thallus of the mushroom, small grains are found, plainly visible with the microscope. As the mushroom has real seeds besides, as we shall see soon, it is probable that these grains are eyes or buds, from which other mushrooms are produced. Upon the thallus of lichens just such buds or grains have been found, and have produced perfect plants; on which account, some botanists have termed them "germ powder." Besides these, we have plants of higher order—*Lilium bulbifrum, L. Tigrium,* and *Tverinana pulchello*—which are reproduced by eyes and buds which fall from the perfect plant. These eyes preserve their vitality even longer than the branches, and it seems probable that these germ grains preserve their power for a long time although they are very small; for the exceedingly small spores of the fern preserve their vitality for a long time. Instances have been known when fern spores, after having lain in the herbarium for thirty years, have germinated.

The propagation of mushrooms by brood is doubtless accomplished in two ways: by torn-off pieces of the thallus itself, or by the germ grains adhering to the same. The foregoing essays gave practical instruction, as regards raising the plants from the brood, but now the question arises, Is it absolutely necessary, in raising mushrooms, that portions of thallus, or germ grains, exist beforehand, or can mushrooms be raised without them? In other words, can there be a spontaneous generation of mushrooms? The answer is not to be implied from the above essays. To settle this question, a bed should be made from stable manure which has never been exposed to brood, in an isolated situation, where it would be impossible for the grain germs to have access. On account of the minuteness of the germs, this will be a difficult thing to accomplish, and we cannot venture an opinon as to the result, except by reverting to laws which are already known to govern in other cases.

Mushrooms are propagated not only by brood and grain germs, but by seeds. The mushroom consists in the greater part, as above said, of the stem and pileus, or hat; on the under side of this latter are found the leaves. If a portion of one of these leaflets be examined through a powerful microscope, a stratum of small tubes or fibres will be seen, which are separated from each other by cellular tissue. This stratum may be seen with the naked eye, or with a glass of low magnifying power; but thus viewed, it appears so dense as to resemble a naked membrane. Porsoon described it as such under the name of *hymenium*. There lies in every tube a row of grains which form granules on the surface of the leaflet, and often cover it entirely. In different species of the "leaf fungi," these seeds assume different colors when matured. In the edible mushroom they are reddish brown. The fungi which are found growing on manure heaps have a remarkable structure. Every seed-tube contains four rows of seed, and when expelled from the tube, they lie in squares on the surface of the leaflet. Mr. LINK is believed to have been the first to describe and demonstrate the structure of the leaf fungi, in an essay which appeared in the magazine of the Association of the Friends of Physiology, in 1807. He is convinced, by his own experiments, that mushrooms grow from leaflets or from the seed which is abundantly contained in them.

In regard to the chemical composition of mushrooms and fungi, we cannot place much reliance on analyses made during the last century. We have recent analyses of many species, especially the poisonous kinds. The most recent and reliable analysis of the edible mushroom (*Agaricus campestris*) was made by Vanquelin, which is quoted by Berzelius in his Compend. Vanquelin found no parenchyma, but some coagulated albumen, together with a nitrogenous compound, which he considers analogous to azone, or the organic principle of meat. This dissolves in water and alcohol, and belongs to the division of extractive matters. Besides this, he found another nitrogenous compound, which dissolves in water or diluted alcohol, and is precipitated by a decoction of nut-galls. The sugar frequently contained in mushrooms is grape sugar, which is not so sweet, dissolves more freely, and is more readily crystallized than cane sugar.

Various experiments have been made of late with a view to discover the best method of improving and increasing the crop of mushrooms, which have been very successful. The method described by Mr. Edward Callow, is highly recommended in the Gardeners' Magazine. In the same periodical, Mr. Collier describes his method, which was crowned with extraordinary success as regards the abundance of the crop, and especially the size of the mushrooms. One specimen was exhibited whose pileus or hat measured 3 feet 7 inches in circumference, and weighed 2 pounds and 1 ounce. The French reporter justly remarks that an improved culture has for its aim not the size but a superior flavor; but he praises the whole process as being well planned and executed, and as being entirely new. The following is the method used:

The bed is made 3 feet deep, with coarse and fine stable manure.

The bed is not completed at once, but in order to prevent fermentation and too great a degree of heat, it is made at two different times, at an interval of five or six days, each time 1½ feet deep, and well pressed down.

A heavy layer of manure, from 3 to 9 inches in depth, is then added.

The bed is never covered closely with boards, but a space of 3 inches at least is left between the cover and the beds.

The deep bed is said to secure a permanent and uniform warmth, the more abundant formation of *thallus*, and the abundant and continued yield.

The last layer of manure is put on for the purpose of growing melons on the bed previous to its use for mushrooms; it is also said to secure uniformity of moisture and a better development of mushrooms.

The greater elevation of cover prevents the attacks of insects by removing their protection, while it allows greater development to the mushrooms.

Mr. Ellis describes a method of raising mushrooms in open fields. He prepares his beds in the usual way, spreading on the top a layer of manure from an old mushroom bed. The beds are then planted with carrots, cauliflowers and radishes, which grow luxuriantly, and protect, by their leaves, the bed from drying out. He gathers several crops during the year, and thinks the expense not greater than that of gathering wild mushrooms, aside from the inconvenience of wet feet, &c., are avoided.

# THE GRAIN APHIS.

BY J. KIRKPATRICK, CLEVELAND, OHIO.

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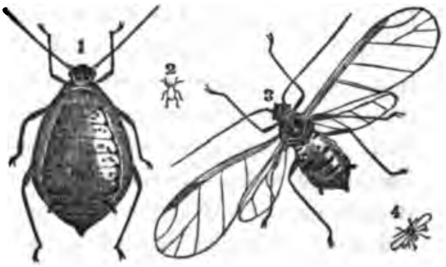
Until the year 1861 the grain aphis was generally unknown in the United States, and no writer in this country had given an account of it from actua observation. Its sudden and simultaneous appearance in that year over a large portion of New York and most of the Eastern States was therefore the more unexpected and surprising. In Europe, where it had been long known, it had never been observed in such numbers, and at no time was there any alarm felt in regard to the amount of injury resultant from its habits. Kirby and Spence, those accurate observers of insect life, devote but five words to this insect, and these in relation to oats only. Kollar does not mention it in his work as existing in Austria. Wilson, in "Our Farm Crops," has but a short notice of, and seems never to have seen it; and this is the less surprising, as it rarely occurs in Scotland. Curtis gives a full and accurate description, with plates, in "Farm Insects." From this work I learn that it was seen by Mr. Markwick and also Mr. Kirby on wheat, oats and barley, in some of the English counties, in 1797. In the "Wheat Plant," published at Cincinnati in 1860, Mr. Klippart gives the annexed figure and description of this aphis, although it had not as yet, to my knowledge, been observed in this country. "Aphis Granaria. Wheat Plant Louse. Inhabits corn crops, having been observed upon barley and oats as well as upon wheat. In July and August it is sometimes abundant in the ears of wheat, sucking the stem and impoverishing the grain. The male is green; figure No. 3 natural dimension; horns very long and black; eyes and three ocelli black; disk of trunk dark; tubes slender, longish and black; nervures of wings pale brown; terminal cell semi-heart-shaped; stigma long and green; hinder legs very long; thighs, excepting the base, tips of shanks and feet, black. Females often apterous (wingless), No. 1; dull orange; horns (excepting the base), eyes and abdominal tubes (which are stouter than in the winged specimens) black; legs blackish; anterior thighs and base of tibiæ more or less ochreous." About the 1st of September, 1861, Prof. J. P. Kirtland received specimens of this insect from a friend who was then on a visit to Schuyler Falls, Clinton county, N. Y., and kindly placed them in my hands,



and in the next issue of the *Ohio Farmer* (7th) they were described by me. The most extensive and useful description of this insect and its habits is that by Dr. Asa Fitch in the New York Agricultural Report for 1860, but not written or published until 1861, the insect not having fallen under Dr. F.'s notice until the latter date, or, in fact, been seen by any person known in that or neighboring States.

But it was not until the present year (1862) that the grain aphis appeared in Ohio, and then was observed simultaneously over a large portion of the State, being first noticed on the wheat immediately subsequent to the appearance of the ear. On barley it was also observed; but as this grain is not so extensively cultivated as the former, less attention was paid to it in this locality. On oats they were at least as plentiful as on wheat, at least in many places. And not only did they invade the fields of grain, but were also numerous on isolated plants by the roadside or among rubbish far removed from fields. In the city of Cleveland I observed great numbers of them on wheat and oats that had sprung up by the sides of fences and in gardens, distant at least a mile from any field of grain. The same must no doubt have occurred at other places.

No family of insects have attracted more attention than the aphides, both for their injuries to growing plants, and also for their peculiar mode of increase. Unlike most insects, as well as all the higher animals, it is not necessary that a union of the sexes should take place, except at intervals of several generations (from seven to thirteen). At a certain period both males and females appear, and, after union, the latter—who are generally, if not always, winged—search for a proper nidus in which to lay their eggs, always selecting that particular plant which will best serve for the food of their future brood. After performing this office, they die, and the eggs remain unhatched until favorable weather, and until the plant is in a stage of growth favorable as food for the young insects. When this occurs, the young animal bursts its shell, and emerges as a very small, apparently perfectly formed aphis, but without wings. This generation is entirely of one sex—female—no males ever occurring among them. Piercing the cuticle of the root, stem, branch or leaf of the root plant with their rostrum, they pump up the nutritious sap, thus diverting it from its proper use, and depleting the plant vampire-like. When the insects are very numerous, the result is often fatal to the plant, unless timely aid is rendered. When fully grown, these females give birth to another generation of living females—not eggs—which in their turn again propagate in a like manner; and this continues throughout a considerable period, or until the food plant, either from ripening or change of season, is no longer able to supply the necessary nourishment. When this period arrives, a generation is born consisting of both sexes; and these copulating, again produce eggs, from which a new brood of females will in time issue, the descendants of which will pass through a like life as their predecessors. Such an anomalous method of propagation has necessarily attracted much attention, violating, as it appears to do, all our preconceived ideas in relation to this subject; it is analogous, however, to the recently discovered phenomenon of parthenogenesis in moths and bees. We have not as yet dipped as deep as we may into the arcana of nature, and it will doubtless be shown that in this day of boasted enlightenment we have been merely groping in the dark. Every day bringeth forth to us new truths that are necessarily as old as the universe.

Many aphides emit, from a couple of tubes placed near the termination of the abdomen, a honey-like fluid secretion; this is greedily collected by ants, who appear to relish it highly, and even protect the aphis from their enemies. The grain aphis does not, however, appear to emit this fluid, at least in sufficient quantity to attract the ants, and the plants are not, in any case seen by me, daubed with this discharge. If there had been enough of this, it might have been visited by bees, who might collect it as honey; but none such were ever seen upon it, although numerous in the vicinity.

When the grain is nearly ripe, the aphis gives birth to a generation consisting of both males and females; and the latter probably selects the fall-sown wheat as the best place on which to deposit her eggs, the latter not hatching until the warm days of spring or early summer. Dr. Asa Fitch, whose opportunities for examining these insects in the first part of the season were evidently very good, says in his report (Transactions of the New York State Agricultural Society, 1860, p. 834): "Early in May last [1861] my attention was particularly directed to this insect for the first time. Rye and wheat sowed last autumn were then but a few inches high, and were just beginning their onward growth with the genial warmth of spring, when I noticed this aphis to be more common than any other insect in every part of every grain-field in my vicinity. Towards the close of May individuals having wings began to occur; and on thus having the insect in its most developed form, I ascertained it was a species which has from time immemorial existed upon the oats, wheat, barley and rye in Europe, and which was first scientifically named *Aphis avenæ* by Fabricius, a name literally meaning the aphis or plant-louse of oats. Kirby and Curtis describe it under the name of *Aphis granaria*, both having overlooked the description which Fabricius has given of it in his "Entomolcgia Systematica," vol. iv. p. 214. Some of the German naturalists name it *Aphis cerealis*, and one of them, probably from supposing the insect on barley different from that on oats, has entered it under the name *Aphis hordei*. . . . . These insects, in growing to maturity, cast off their skins three or four times at least; and numbers of these empty skins, of a whitish color, were everywhere noticed among clusters of the lice. The insects themselves occurred in three very distinct forms upon the grain through the season: 1st, winged females; 2d, wingless females (these being more numerous than the winged ones); and 3d, young lice, or larvæ. Persons who looked at them very closely might have noticed a few individuals of a fourth form, namely, the pupæ, which were to become winged females—these having the wings in a rudimentary state, and appearing like small scales appressed to the sides of the body. I have never yet seen a male of this species."

In the early part of the season, and before the ear bursts forth, the aphis punctures the leaves and perhaps tender stem of the plant; but when the ear appears, it forsakes the leaves for the more desirable juice elaborated for perfecting the grain, and attaches itself to the base of the glumes (outer husk or chaff), and may be often seen forming a circlet of several individuals around each grain. This is most easily observed on oats, the grains being widely separate. When the insects are very numerous, it may easily be seen that such a constant drain of juice diverted from its legitimate object must be highly injurious to the young kernel; it becomes shriveled, or rather never becomes plump, and may be entirely abortive, resulting in a light crop. It is rather remarkable that the insects that feed on the juice of the stem and leaves are of a green color, while those that derive their nourishment from the base of the grain are of a dull orange or even brown color. And it is of these latter colors that the aphis is most commonly seen. A peculiar provision of nature, which enables this species to change its location during the season, is, that winged females occur among the usually wingless ones, and the former can thus leave the plants on which they were bred, and that are rapidly ripening, for other and younger ones, and even entirely different fields and species, thus establishing new colonies during the whole season of growth. This partly explains why the insect increases so rapidly and appears so suddenly in regions where previously unknown, for it is only necessary that these winged females should migrate in myriads from an occupied region, during the favorable season, to a new one, and so rapid is their increase that in a single year they will overrun our grain-fields. The prevalence of a light wind in the proper direction will also aid them materially, for it is well known that many insects rise high in the air at times, and are carried by it great distances. It seems also that at times the usual checks upon insect increase are removed; and when this is the case, an unusual number of a particular species appear. This is the case with the army worm and many others, and no doubt with the species under consideration. The herbivorous insects are kept chiefly in check by other and rapacious or parasitic species; and should these by any means become scarce, soon an unusual number of the former will appear. But this increase of life brings with it its own destruction. The rapacious and parasitic species have at least equal powers of propagation, and the abundance of food give them every opportunity to "increase and multiply;" consequently it rarely happens that we suffer from the devastation of the herbivorous insects for more than one season at a time. This aphis is no exception to the rule. In its immigration it was accompanied by its special deadly enemies, and no doubt found many aboriginal to the country on arrival, that were willing to aid in destroying it by various means. Although the parasites of this insect found in England—*Aphidius avenæ* and *Ephedrus plagiator*—are unknown here, several nearly allied species take their place, and of these four have been described by Dr. Fitch, and named by him the Wheat-louse Aphidius—*Toxares triticophis;* Oat-louse Aphidius—*Praon avenaphis;* Wheat Allotria—*Allotria tritici;* and Oat Allotria—*A. avenæ.* These are all very minute, black, four-winged flies, the two first belonging to the family *Braconidæ,* and the two last to that of *Cyniphidæ.* The perfect insects do not eat the aphis, but deposit their eggs in their bodies, which, hatching, devour the interior of the unhappy insect while still living and feeding. These aphidius-stung individuals grow to a great size, but previously leave their companions and attach themselves firmly to the plant, where, turning a brown color, they die, remaining still firmly fixed. After the aphidius has undergone its final transformation—for all its changes take place in the body of the aphis—it makes its way through the abdomen of its prey, which is now nothing but an inflated skin, and, seeking its mate, prepares to propagate its kind. I have seen a great many of these swollen individuals on wheat and oats, in the vicinity of Cleveland. Lady-birds—*Coccinella*—both in the larva and perfect states, devour great numbers of green flies, and many of our smaller birds derive a large amount of their food from the same source. All combined keep the pest within bounds, and there is little reason to be afraid that this will become a permanent dweller in our State, to the extent of being uniformly injurious.

# VIEW OF THE CONDITION AND PROGRESS OF AGRICULTURE IN THE UNITED STATES.

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The following article is from an advance copy of a Preliminary Report of the census for 1860, kindly furnished me by J. C. G. KENNEDY, the Superintendent of that Bureau. KLIPPART.

It appears from the returns of the last census, that the ratio of increase of the principal agricultural products of the United States has more than kept pace with the increase of population. Indeed, there appears no reason to doubt the continuance of an abundant supply of all the great staple articles, equal to the necessities of any possible increase of population or national contingency for ages to come. It is also gratifying to note the evidences of improvement in some of the most important agricultural operations, proving that our farmers are fully in sympathy with the progressive spirit of the age, and not behind their fellow-citizens engaged in other industrial occupations. The products of the Great West are giving a tone to the markets of Great Britain and the continent. Chicago has become one of the first grain markets in the world, and as the boundless region still further west is being developed, every channel of communication with the Atlantic coast will teem with the products of the soil. Illinois alone sends now to the great market at New York an average of two thousand head of cattle weekly, and other States, comprising regions almost unknown at the former census, and still more distant from the seaboard, are adding and increasing their contributions.

New plants and animals have been introduced in the past decade. From the products of the sugar cane—*sorghum saccharatum*—transplanted from the Chinese empire, the West is furnished with a new article of domestic luxury and utility, and rendered comparatively independent of the sugar cane of more Southern States.

The great dairy interest in our country during this period has increased the production of cheese and butter, and already American cheese is as well known in English markets as the best English dairy cheese.

Indian corn is now an indispensable article for Great Britain, and each succeeding year is increasing the demand for this important product of our country, which is raised in every State and Territory of our Union.

While it is admitted that very much remains to be accomplished by the agricultural interest of our country, it cannot be doubted that the past ten years has shown to the world that the United States has within its own territory the resources which will enable us to compete with the older nations of the world in every department of domestic industry.

The London exhibition in 1851 made known that the United States had the means of supplying the implements and machinery needed in every country in Europe. Since that time our reapers and mowers, plows, steam engines, and railroad cars have found their way to the Old World, and an American in taking the tour of the continent will, in the great empire of Russia, find himself on board of an American railroad car drawn by an American locomotive on a railroad built by an American engineer. We point to these advances as evidence that the enterprise of our countrymen, with so wide a scope for its development at home, manifests itself wherever a profitable field opens for its exercise abroad.

At a period like the present, when, for the preservation of the national life and character, the resources of the country are subjected to a greater strain than they have ever yet borne, when a large portion of its effective labor is diverted to the same sacred duty, and all the productive forces of the Union are controlled to an unprecedented extent by causes more pervading and subversive in their effects than any which could possibly arise from extraneous sources, it is a subject of the highest gratification that we are blessed with the amplest returns from the labors of the husbandman. The crops of hay and grain, as the result of a favorable season and a broader cultivation of land, are believed especially to have afforded abundant and timely harvests. Regarded either as a source of cheap and ample supply for a vast commissariat with the least possible drain upon the public chest, of cheap and plenary subsistence to the numerous unemployed and dependent classes, or as a source of exports and employment for the commercial and shipping interests, the bounty of our land is at the present time a subject of national congratulation and thankfulness.

The increasing annual products of agriculture in our highly-favored country, and the hay and grain crops in particular, furnish striking illustrations of the close interdependence and connection of all branches of the national industry. The dependence of agriculture upon the results of mechanical skill, as well as the astonishing progress of the latter within the last half century, is strongly exemplified in the application of labor-saving appliances, which become still more valuable, in emergencies like the present, in all the operations of the farm. The saving effected by new and improved implements in Great Britain within a dozen years preceding 1851 was stated by a competent authority to be not less than one-half on all the main branches of farm labor. Our own progress in this respect is believed to have been more rapid than that of any other agricultural people, and to be in advance of our application of the fruits of purely scientific research in the improvement of agriculture. In nearly every department of rural industry mechanical power has wrought a revolution. The inventive genius of the country has not only contrived to make it prepa[illegible]he crop for market and to sew or knit the family apparel of the farmer, but to rock and "tend" the infant as well as to rend from the embrace of earth the century-rooted oak which our fathers were forced to leave to the slow eradication of time. Whether the superior agricultural advantages and the demand for improved implements and machinery in the United States have stimulated the facile ingenuity of our mechanics, or have only been seconded by its ready contributions to industry, we shall not stop to inquire. The greatest triumphs of mechanical skill in its application to agriculture are witnessed in the instruments adapted to the tillage, harvesting, and subsequent handling of the immense grain crops of the country, and particularly upon the western prairies. Without the improvements in plows and other implements of tillage which have been multiplied to an incredible extent, and are now apparently about to culminate in the steam plow, the vast wheat and corn crops of those fertile plains could not probably be raised. But were it possible to produce wheat upon the scale that it is now raised, much of the profit and not a little of the product would be lost were the farmer compelled to wait upon the slow process of the sickle, the cradle, and the hand-rake for securing it when ripe. The reaping-machine, the harvester, and machines for threshing, winnowing and cleaning his wheat for the market have become quite indispensable to every large grain grower. The commercial importance of the wheat crop and its various relations to the subject of domestic and foreign supply, to markets, the means of transportation, storage, &c., make it highly important that the producer shall have the means of putting his crop in the market at the earliest or most favorable time and with the greatest precision.

*Wheat.*—The quantity of wheat grown in all the States and Territories in the year 1849 was 100,485,944 bushels. The quantity grown in 1859 was 171,183,381 bushels, an increase of nearly seventy per centum, or about double the increase of population in the same period. Some of the older wheat growing States—Pennsylvania, Virginia, New York, and Ohio—do not show a proportionate increase, owing to the destructive agency of the wheat midge, and the consequent unwillingness of farmers to subject themselves to repeated losses from this cause. Fortunately, the midge is diminishing where it was formerly most destructive, and wheat-growing will soon be resumed in many localities in these States where for a time it was almost abandoned. To the introduction and greatly extended cultivation of spring wheat in the Northwestern States, is the country mainly indebted for the increase in the amount of wheat produced. In Illinois this crop has increased in ten years from 9,414,577 bushels to 24,159,500 bushels; in Wisconsin, from 4,286,131 to 15,812,625 bushels in the same period. In many cases in these States the quantity grown has exceeded the means of ready transportation, or the demands of the market, and has therefore been too great to be profitable.

There appears among the contributions of the New York State Agricultural Society a statement of Dr. Asa Fitch, entomologist for that useful association, relating to depredatory insects, of so much general interest as to claim insertion in this report. It is a matter of no small import that this association have introduced into this country from abroad certain parasites which Providence has created to counteract the destructive powers of some [illegible] these depredators, by limiting their efficiency and destroying their numbers. We have heretofore been suffering from the destructive agency of some of these enemies to the grain crop, which have been introduced from abroad, without enjoying the influence of their natural enemies which remained at home. It is gratifying to realize that the New York State Agricultural Society has manifested a spirit so philanthropic in conception, with the prospect of results so important.

Dr. Fitch remarks:

"The grain aphis made its advent in a most remarkable manner. That an insect never seen before and not known to be present in our country should suddenly be found everywhere in New England, and most of the State of New York, in profuse numbers in every grain field of this wide extent of territory, and literally swarming upon and smothering the crop in many fields, was a phenomenon which probably has no parallel in the annals of science. How it was possible for this insect so suddenly to become thus astonishingly numerous was a mystery which seemed to most persons to be inexplicable. It is the most prolific of any insect which has ever been observed. I find it commences bearing when it is but three days old, and produces four young daily. Thus the descendants of a single aphis will in twenty days amount to upwards of two millions, each day increasing their number to almost double what they were the day before. This serves to account for the surprising numbers which we had of this insect.

"The aphis was everywhere supposed to be a new insect, and one writer went so far as to name and describe it scientifically, in full confidence that the world had never before known anything like it. My examinations, however, fully assured me that it was identical with a species which has long been known in the grain fields of Europe. And on my announcing this, the erroneous views which one and another were adopting were speedily abandoned.

"Our best European accounts of this insect are very imperfect. They only speak of it as occurring in June and July, whereas I find it is present on the grain the whole year round. And when the grain is but a few inches high, if half a dozen of these insects happen to locate themselves on the same plant they suck out its juice to such an extent that the plant withers and dies.

"As yet I have never been able to find a male of this species. They are all females. This is proved by placing any one supposed to be a male in a vial; next morning two or three young lice are always found in the vial with it. The general habits of insects of this kind are well known. The aphis on the apple tree and other fruit trees, when cold weather arrives, give birth to males. The sexes then pair, and the female thereupon deposits eggs, which remain through the winter to start these insects again the following year. I had supposed it would be the same with this aphis on the grain. I thought, when autumn arrived, I should meet with males and find eggs dropped on the blades of the grain. But there were none. The females and their young continued to appear on the grain till the end of the season. They are everywhere on the grain now, buried under the snow, ready to warm into life and activity again when the spring opens. And on grain growing in flower pots, on which I am keeping these insects in full activity through the winter to notice what I can of their habits, no males have yet appeared. When, and under what circumstances this sex will be produced, is a most curious subject, still remaining to be ascertained. It at present looks as though the female and their descendants were prolific permanently, without any intercourse of the sexes.

"Last summer such multitudes of parasites, ladybugs, and other destroyers of this aphis, had become gathered in the grain fields at harvest time that it seemed as though it would be exterminated by them. But at the end of the season this insect appeared as common on the young rye as I had noticed it at the opening of spring. The present indications, therefore, are that this aphis will be as numerous on the grain the coming summer as it was the past, if the season proves favorable to its increase.

"As to the *army worm*, it may be remarked that for almost a century it had been known that in this country was a kind of worm whose habit it was to suddenly appear in particular spots in such immense numbers as to wholly consume the herbage over an extent frequently of several miles, and then abruptly vanish, nothing being seen of it afterwards. Thus it was one of the most singular and also one of the most formidable and alarming creatures of this class that was known to be in our world. Yet, what kind of worm this was, and what insect produced it, remained wholly unknown down to the present day. Appearing here and there all over the country the past season, this army worm became an object of the deepest interest; and from Illinois on the one hand, and Massachusetts on the other, specimens of the moths bred from these worms were sent to me for information as to what the name of this insect really was.

"With regard to the *wheat midge*, I would observe that in this country injurious insects are much more numerous than in Europe, occasioning us far greater losses than are there experienced. A year ago I received from France a vial filled with insects as they were promiscuously gathered by the net in the wheat fields of a district where the midge was doing much injury. It then occurred to me that by gathering the insects of our wheat fields here in the same manner, it would furnish materials for a very accurate comparison of the wheat insects of this country with those of Europe. As the result of a comparison thus made, I find that in our wheat fields here the midge formed 59 per cent. of all the insects on this grain the past summer; whilst in France, the preceding summer, only seven per cent. of the insects on wheat were of this species. In France, the parasitic destroyers of the midge amounted to 85 per cent.; while, in this country, our parasites form only 10 per cent. And after the full investigation of the subject which I have now made, I can state this fact with confidence—*we have no parasites in this country that destroy the wheat midge*. The insect so common on wheat, and which resembles the European parasites of the midge so closely that, in the New York Natural History, it is described as being one of that species, and in the Ohio Agricultural Reports it is confidently set down as another of them, I find has nothing to do with the wheat midge, but is the parasite of an ash gray bug which is common on grain and grass, laying its eggs in the eggs of this bug, and thus destroying them.

"I stated to the society, a year since, that the wheat midge had wholly vanished the previous summer; not one of its larvæ could I find, on a careful search over an extensive district around me. But the past season this insect appeared in the wheat again, as numerous as usual. This has led us into important changes in our views of the habits of this insect. How was it possible for it to utterly disappear from the wheat one year and be back in it in swarms the next year? Obviously it must have other places of breeding than in the wheat. And, therefore, if no wheat was grown in this country for a few years, as has so often been proposed, it would not starve and kill out this insect. The insect would resort to other situations, and would sustain itself there, returning into the wheat again as numerous as before, when its cultivation was recommenced. And what could it be that banished this insect from the wheat in 1860, and brought it back again in 1861? The remarkable difference in the weather of these two years furnishes an answer to this question. When the midge fly came out to deposit its eggs in June, 1860, the weather was excessively dry; in 1861 it was very wet and showery. And thus we learn the fact that these flies cannot breathe a dry, warm atmosphere; they are forced to retreat to places where the air is damp and moist. When the uplands, the plowed fields, are parched with drought, the midge cannot abide in them; it must go to the lowlands along the margins of streams, where it must remain so long as the drought continues. Here it must lay its eggs and rear its young, depositing them, probably, in the grass growing in these situations. And hence we also learn that if the last half of June is unusually dry, our wheat that year will escape injury from the midge; but if the last half of June is very wet and showery, this crop will be severely devastated."

*Indian corn*—This crop in 1849 was 592,071,104 bushels; in 1859 it was 830,451,707 bushels, which is an increase of more than forty per cent. In a majority of the States this is undoubtedly the most popular crop; it is less liable to failure than any other, and is applied to so great a variety of useful purposes. No important changes have been made either in the varieties cultivated or in the modes of cultivation, except in the gradual substitution of animal for human labor.

*Cotton.*—The rapidity with which the cultivation of cotton has increased in the United States is truly wonderful. In the beginning of the present century the annual exportation was less than 5,000 bales; in 1849 the quantity grown had reached 2,445,793 bales of ginned cotton of 400 pounds each; in 1859 it had further increased to 5,196,944 bales, or more than 110 per cent. in ten years. The whole crop is the product of thirteen States, but is chiefly obtained from eight of them. Immense as is the quantity of cotton produced, the demand is equal to the supply. Prior to the production of cotton in such vast quantities in the more southern States, it was extensively cultivated for domestic purposes in North Carolina, Virginia, Maryland, Delaware, and southern Illinois, and it is not improbable that its cultivation may be reëstablished in some of these States with profit to the producer and advantage to the consumer.

*Dairy products.*—The quantity of butter produced in the census year 1859–'60 is set down at 460,509,854 pounds, which is an increase of 46 per cent. on the product of 1849–'50. The amount of cheese returned is 105,875,135 pounds, or 339,242 pounds more than the product of 1849–'50. Cheese is especially rich in flesh-forming constituents, and is therefore regarded as a highly nutritious article of diet, well adapted to the use of the laboring man, and capable of doing more to repair the waste of muscular exertion than many times its weight of butter or of fat meat. Still it appears that cheese does not enter largely into the daily food of the working classes of this country, as it does in Germany and Great Britain. Were it produced more abundantly, and sold at a lower price, it is probable that an article of food so convenient and economical would be more fully used. The cheese exported from the United States to other countries is about 15,000,000 pounds annually. In fact, were cheese-making as well understood in our country generally as it is in Europe, the demand would be greatly increased. It is believed that our people suffer immensely by not thoroughly understanding the most approved processes of cheese-making. Comparatively little of the prodigious quantity produced can be termed a first rate article. While many of our most enterprising dairymen supply an article creditable to the country, in Europe what is termed American cheese is not purchased with that confidence with which we receive theirs, and for the reason that the processes have not reached that perfection which alone contributes to uniformity of excellence and distinctiveness of character.

When this point is attained a taste is cultivated, and increasing demand follows, and profits enlarge. An article so nutritious and easy of transportation should form some portion of our army rations.

*Domestic animals.*—The tables of agriculture will show a satisfactory increase in the live stock of the country. In addition to returns of animals employed in agriculture and possessed by farmers, we have prepared a table from the returns of the census-takers which represent an *estimate* of the different varieties of live stock which, being owned by persons not engaged in agricultural pursuits, were not included in the agricultural schedule. These returns we believe entitled to confidence, and they swell considerably the numbers contained in the official statements. As all live stock thus circumstanced was omitted in the previous census, we have, in all our comparisons and calculations, ignored it, because, being omitted in previous censuses, its introduction into the figures at this time would interfere with the apparent rate of increase.

The horses included in the table referred to comprise carriage, team and other horses which were previously, and in this census, omitted, but which will be seen to make a vast increase to the number returned in the agricultural schedule. The addition to all varieties of live stock thus made to appear, and which exists, is a matter of no inconsiderable importance.

*Value of animals slaughtered.*—The value of slaughtered animals for 1849 was $111,703,142, in 1859 it had reached $212,871,653, the largest part of the increase being in the western States. The manufacturers of soap, candles, leather, glue, bone-black and others depending on this source for their material have received a proportionate development.

*Sheep and wool.*—The number of sheep returned by the census of 1850 was 21,723,220, and the amount of wool 52,516,959 pounds. In 1860 the number of sheep returned was 23,317,756, and the amount of wool 60,511,343 pounds.

In addition to the number of sheep above mentioned, as returned by the census, the assistant marshals reported 1,505,810 as their estimate of the number of sheep not included because owned by others than farmers, so that the entire number of sheep in the United States, on the 1st day of June, may safely be placed at 62,017,153, and a proportionate amount may be added with propriety to the clip of wool for the same period.

While the sheep of the United States increased but 1,594,536 between 1850 and 1860, the imports of wool and woollens during that period were as follows:

| Year. | Value of imports of unmanufactured wool. | Value of imports of manufactured wool. | Year. | Value of imports of unmanufactured wool. | Value of imports of manufactured wool. |
|---|---|---|---|---|---|
| 1850.......... | $1,681,691 | $17,151,509 | 1856.......... | $1,665,064 | $31,961,793 |
| 1851.......... | 3,833,157 | 19,507,309 | 1857.......... | 2,125,744 | 31,286,118 |
| 1852.......... | 1,930,711 | 17,573,964 | 1858.......... | 4,022,635 | 26,486,091 |
| 1853.......... | 2,669,718 | 27,621,911 | 1859.......... | 4,444,954 | 33,521,956 |
| 1854.......... | 2,822,185 | 32,382,594 | 1860.......... | 4,842,152 | 37,937,190 |
| 1855.......... | 2,072,139 | 24,404,149 | | | |

The aggregate exports of domestic wool during the whole of the same period only reached the value of $1,562,502; and there were no exports of domestic manufactures of wool.

The average price of fine wool in one of our principal wool markets (Boston) for the last thirty-five years has been $50\frac{3}{10}$ cents per pound; of medium, $42\frac{8}{10}$ cents; of coarse, 35½ cents. The consumption of mutton has rapidly increased. The supply now as rarely exceeds the demand as with any other meat, and the best qualities out-sell beef in our markets.

No country is better adapted by natural, and, on the whole, by artificial, conditions to the production of wool than the United States. It appears to be conceded that Australia and South America contain the only very extensive regions of the earth now capable of competing with equal areas of our country in this production. That narrow rim of vegetation which encloses the vast inland deserts of Australia presents not a circumstance of superiority, for this object, over the immense natural pastures of our western and southwestern States and Territories, and it is manifestly inferior to them in important conditions. Portions of it are destitute of running streams for hundreds of miles, and it is subject to the periodical recurrence of droughts, which in some cases have extended through years, drying up all minor vegetation, and proving most destructive to flocks and herds. The government price of lands is higher than in the United States. Its distance from its wool market equals nearly half the circumference of the globe. Yet its exports of wool rose between 1810 and 1850 from 167 pounds to 40,000,000 pounds! South America is also becoming an extensive producer and exporter of this staple. Here, too, no natural conditions of superiority over those of the United States present themselves, while there are political and moral ones which undeniably are hostile to the security and permanence of so exposed a branch of industry.

Apart from the mere question of the cheap production of wool, the experience of the most advanced agricultural nations, like England, Germany, and France, goes to show that sheep are a necessity of a good general system of husbandry on even the highest priced lands and amidst the densest population. They afford as much food to man, in proportion to their own consumption, as any other domestic animals. They are believed to return more fertilizing matter to the soil. In addition to these things, they alone furnish wool. England proper has about five hundred and ninety sheep to the square mile. The United States proper (exclusive of Territories) have about forty-eight to the square mile.

Our people have not lacked the necessary breeds to embark vigorously and advantageously in every department of sheep husbandry. In fine-wool varieties we have selections from the best flocks of Germany. In varieties ranging from fine to medium we have the American merino, yielding fifty per centum more wool than his Spanish ancestor, without a deterioration in its quality. In coarse varieties, we have the choicest mutton-breeds of England, and also hardy and productive sub-varieties between these and what are termed our native sheep. No country has ever been so liberal in importing the most highly-esteemed foreign breeds of sheep, and none has been more successful in acclimating them. Some have been greatly improved among us, and none, it is believed, have degenerated where the systems adapted to their culture have been found profitable.

In view of all the preceding facts, it would seem most anomalous that a people so intelligent and enterprising as our own should have advanced so slowly in one of the most important departments of industry, should have consented so long and so largely to import a prime necessary of life which they could actually produce and market at a less cost than the exporter.

American wool-growers attribute this state of things mainly to two causes: tariff regulations, which give protection to the woolen manufacturer and not to the producer, and to the unsteadiness which has marked our tariff policies. Though the monetary state of the country and other incidental causes have undoubtedly contributed their influences, it is not to be denied that a comparison of wool prices under the different tariffs gives color to the first conclusion, because, contrary to all the earlier anticipations of the growers, they show that there has been no coincidence whatever between high and low wool prices and what are termed high and low tariffs, but quite as often precisely the reverse. If the above position of the producer is well taken—if he is not equally protected with the manufacturer—it is not a sufficient answer to his complaint to say that he needs no protection because he can already produce the staple as cheaply as his foreign competitor. The ordinary wool-growers of the United States can no more live as he now lives, on the same profits which content the wealthy Anglo-Australian or South American grower, than can our ordinary manufacturers live as they now live on the profits which content the manufacturers of Europe. Much the greater number of our producers are comparatively small land-holders and capitalists, yet they have the duties of intelligent freemen to discharge and the expenses of liberal members of society to incur. Their expenditures in directions which tend to comfort and self-respect, and which promote civilization and the public interests, are ten times greater than those of persons of the same wealth in the foreign countries from which the competition comes. Is not our government as much bound, both by justice and expediency, to assist this class of men to preserve their respectable status as to render like assistance to any other class? Is the production of a great staple of less consequence to our country than its manufacture?

It is complained that the rapid and almost radical changes which have taken place in our tariff legislation, now stimulating both the producer and manufacturer of wool beyond the boundaries of prudence, and now suddenly withdrawing much of the protection on which their anticipations and arrangements for the future were founded, have necessarily led to ruinous disappointments, and finally impaired the confidence of the community in the safety of investments in a husbandry subject to such interferences.

The present would seem an auspicious period to establish permanent policies in these particulars. One of the principal causes which has rendered it difficult to estimate the public receipts in advance—the fluctuations between large and small sales of the public lands—is now probably removed. These sales, always advancing at the same time with imports and duties, that is, in periods of pecuniary inflation, were sometimes sufficient at such periods, with the aid of only a moderate tariff, to lead to the accumulation of large surpluses of revenue. These produced clamorous and successful calls for a reduction of duties. But in periods of pecuniary depression the sales of the public lands fell off; the reduced tariff was found insufficient to raise the necessary revenue, and another change in the opposite direction became necessary.

While it is not probable that surplus revenues will accrue, from any cause, for many years to come, the most intelligent and experienced wool-growers of our country ask for no extreme or disproportioned legislation in their behalf. They only ask that in establishing a system of revenue adequate to the public wants, the interest they represent receive a share of protection fairly proportioned to its importance and requirements. If this is accorded, and the policy established is allowed to acquire a permanent character, it is not doubted by our agriculturists that this important branch of industry will rapidly attain a development which will no longer leave us tributary to foreign nations for one of the most important necessaries of life.

In view of the limited number of American publications devoted to sheep husbandry which have appeared, we feel it a duty to refer to a valuable repertory of useful information, being a treatise on fine-wool sheep husbandry, by Henry S. Randall, LL.D., of New York, read before the New York State Agricultural Society, February 12, 1862. 127 pages, 8vo.

*Sugar and molasses.*—Notwithstanding the large quantities of sugar and molasses produced in the United States, a large amount is obtained from abroad. The sum paid for imported sugars, in 1859, exceeded $31,000,000, and in the same season 30,000,000 of gallons of molasses were imported.

The rapidly increasing culture of the Chinese sugar-cane is supplying a great want. The introduction of such a crop to the notice of the American farmer is a prominent feature of the past decade. While, in the present state of knowledge, much difficulty and uncertainty seems to attend the manufacture of sugar from this plant, it has proved its value as very productive in syrup or molasses. The plants introduced into this country are from Asia and Africa, and vary considerably in character. They are liable to hybridization with each other, and with the broom corn, and much care is required to preserve the varieties distinct. So far as we have information, Mr. J. H. Smith, of Quincy, Illinois, has been the most successful cultivator of the imphee, and his efforts have been attended with much success. While, with our knowledge of the disappointments which have been experienced in Europe and this country as to results, we would not recommend a heedless expenditure of time and means in the culture of the imphee, we are sufficiently confident in its value, under many circumstances, as to hope that farmers generally of the North and West will devote some attention to the culture of the plant, and fairly test its utility for the production of sugar.

The product of cane sugar, as returned by the Seventh Census, was 237,133 hogsheads of 1,000 pounds each; in 1859 it was 302,205 hogsheads. The product of molasses for the former year was 12,700,991 gallons; for the latter 16,337,080 gallons. From the sorghum and imphee, 7,235,025 gallons of molasses were made in 1859.

The amount of maple sugar made in 1850 was 34,253,436 pounds; in 1860 the product was 38,863,884 pounds. This increase is not large, but sufficient to afford gratifying evidence that our beautiful maple groves and forests are not becoming extinct, while many are preserved with commendable care. We wish it could, with truth, be added that the cultivation of this noble tree was extending in a ratio equal that wherein the old trees in the forest are diminishing under bad treatment and the demands for new land for tillage. The landholder who appropriates a few rods of land to the preservation or cultivation of the sugar trees not only increases the value of his estate but confers a benefit upon future generations.

*Tobacco.*—The tobacco crop, in 1849, amounted to 199,752,655 pounds, being a decrease of more than 19,000,000 pounds according to the previous census; in 1859 it reached 429,390,771 pounds.

To the production of this amount every State and Territory contributed, although Virginia and Kentucky furnished much more than any other. It would seem surprising that a crop which is said to impoverish the soil more than any other, and to injure to some extent every one who uses it, should be found so desirable as to increase 106 per cent. in ten years; but such is the effect of a ready market with remunerative prices. Several of the northern States present a very large increase in the production of this article. Among these, Ohio, New York, Connecticut, Massachusetts and Pennsylvania exhibit both the largest product and the greatest increase. Ohio raised, in 1859, over 25½ million pounds, and New York increased her production from 83,189 pounds to 5,764,582 pounds;

Massachusetts from 133,246 to 3,233,198, and Connecticut from 1,267,624 to 6,000,133 pounds. Virginia, North Carolina, Maryland, Kentucky, and other of the more southern States show a greatly augmented growth of the staple.

There has been a commensurate increase in the manufacture of snuff, cigars, and other ultimate products of the tobacco crop, while the consumption of the article in various forms doubtless keeps pace with the production.

*Wine.*—The returns upon the subject of wine-making show a very large increase in an article which promises to become one of great commercial value. The wine culture has increased in a considerable number of States, but more particularly in Ohio, California, and Kentucky. The quantity of domestic wine was increased from 221,249 gallons in all the States and Territories in 1850, to 1,860,008 gallons in twenty-two States in 1860, or at the rate of 740 per cent. Of this quantity the three States above named made nearly one million gallons, and Ohio alone more than half a million gallons. The return was probably far short of the real amount.

The culture of the grape and the manufacture of wine are rapidly increasing. So soon as cultivators become assured that they possess varieties of the grape of sufficiently good quality, thoroughly hardy and adapted to our climate, the development of this form of industry is likely to be still more rapid. More than $4,000,000 was paid by citizens of the United States in 1859 for imported wines; the amount paid by consumers for a factitious home-made article it is perhaps impossible to ascertain. A good native wine may and should at once take the place of the spurious article, and in a few years of a large part of the imported. This is the more desirable, inasmuch as the disease which so seriously affects the vineyards of Europe greatly diminishes the quantity and increases the price of good wine, and at the same time tempts producers there to practice extensive adulterations. Nothing will effect a substantial temperance reform so certainly and speedily as the production of good wines in such quantity as to place them within the means of the poor as well as the rich; and every man who plants a vine will be a useful coöperator in the beneficent work of relieving the country from the evils of intemperance by the substitution of a healthy beverage for the various forms of poisons which take the name of spirits and concentrate and diffuse misery over the land.

*Hay and clover.*—The hay crop of 1849 was 13,838,642 tons; in 1859 the quantity reported is 19,129,128 tons. This increase is not proportionate to the increase of live stock in the country; but it appears that, with better farming, more roots and cut straw and other rough fodder are used, and therefore less hay is required. Without adding to the present extent of meadow lands, the hay crop might probably be greatly increased by the careful introduction of the best varieties of grass.

The quantity of clover-seed grown in 1849 was 468,978 bushels; in 1859 the amount was 929,010 bushels. This increase is important not only in a commercial point of view, but still more so as indicative of improvement in our agricultural system.

*Orchard products.*—These consist principally of apples and peaches, dried and undried. Their value in 1849 was $7,723,186; in 1859 it had reached $19,759,361. This large increase is principally due to the fact that for several years great attention has been paid to the introduction and cultivation of improved varieties of fruit, and to processes for the preservation of fruits by artificial means, which now occupy a great amount of capital. The pear, which for several years was almost left out of general cultivation on account of what was termed the "blight," has of late been less affected by this injury than formerly, and is now extending rapidly in public estimation, being justly regarded as one of the most delicious and profitable of fruits.

*Silk.*—The production of raw silk in the United States still remains inconsiderable in comparison with what was at one time expected. It has, however, been demonstrated that many parts of the country are well adapted to the growth of the mulberry, and that the production of silk is profitable. Were silk-raising pursued steadily wherever the climate is suitable, very profitable employment would be afforded to thousands of persons, especially females, who are now almost without such employment during a considerable portion of their time. The best way to make silk-growing profitable to individuals and the country, is to encourage its production in small quantities by many families, rather than for a few persons to undertake its production on a large scale; at least, such is the lesson taught by all silk-producing countries. By such means the cost would prove trifling, but the aggregate product would be immense. The value of silks of all kinds imported in the year ending June, 1860, exceeded $33,000,000.

*Improvements.*—No better evidence of the progressive improvement of American agriculture need be adduced than the great amount of animal forces employed to assist the labor of man. The number of horses, mules, and oxen engaged in agricultural labor is probably greater than the number of men, a proportion that has no parallel in any other country. All of this animal force is, of course, made available through some form of machinery. Since the preceding census the use of the reaper and mower has become not merely general, but almost universal. Some of the most important crops are now seeded, cultivated, gathered, and prepared for use or market with little or no labor from man except where he is aided by mechanical appliances and animal force. The employment of steam in agricultural operations is much less common in the United States than in Great Britain, but is gradually increasing.

*Draining.*—This important improvement has made great progress in the estimation and practice of our farmers. Tile factories have been established extensively in many parts of the country, and consequently the material for making permanent drains is much cheapened.

Should the next ten years witness an equal advance in this direction, underdraining will be regarded as among the most indispensable operations of the farm, and its benefits will soon be fully realized.

Underground draining involves an amount of wealth not yet appreciated, though rapidly becoming realized by the American farmer. It is an undoubted fact that the most productive portions of our farms, and which are fertile in fevers, lie neglected and worse than useless for the want of knowledge or the absence of enterprise. An assistant marshal in the State of New York made report of one farmer near Geneva, who has laid on a moderate-sized farm some fifty miles of tiles, and acquired wealth as the result. A single year's crop from land before useless has sometimes paid all the expense of the improvement, and the drains made twenty years since are as efficient as when first constructed. For health and wealth nothing contributes more, where circumstances admit of it—and where do they not, to a greater or less extent?—than underground drainage. An implement of great value has recently been patented, which opens and covers a furrow of considerable depth, and lays at the same time pipe for introducing or carrying off water.

*Irrigation.*—This is already found to be necessary or highly beneficial in Utah, New Mexico, and California, and is there extensively practiced. To systematic irrigation we may look for covering with luxuriant vegetation millions of acres now commonly regarded as unfit for cultivation. It will doubtless be found to prove remunerative in many of the older States where it has not yet been adopted.

*Progress of invention in threshing instruments.*—As next in point of importance to the production of grain consists the facility for its early and economical preparation for market, the value of implements and machinery tending to this end cannot be overestimated; and as the progress whereby perfection is attained in any improvement so valuable as that which has, through a long process of years, attended the construction of threshing implements, is interesting to the political economist as well as the farmer and statesman, we have endeavored to group together all the essential facts connected with their history. The plow, hay and grain cutters, and some other implements of husbandry, have attained to such perfection within a short period, and their history is so generally known to the present generation, that special allusion to them may with propriety be deferred to a future period.

It appears that the number of patents granted in the United States for threshing-machines, exclusive of a considerable number for threshing clover, and those combining threshing apparatus with cider or grist mills, straw-cutters, &c., was *three hundred and fifty-four*—a larger number than had been given for any other instrument or process, except the plow and the water-wheel.

Some kind of mechanical means for separating grain from the ear appears to have been early contrived. A complete history of the successive changes in the means and instruments for effecting this would be a curious and interesting chapter in the record of the world's progress. Such a retrospect, could it be made, would show a remarkable uniformity in the methods adopted throughout the world in ancient and modern times. It would show that, until within a recent period, mankind has been altogether unsuccessful in originating or transmitting any essential improvement upon the most ancient plan of which we have any record.

The primitive mode of "treading out the corn" upon a smooth circular "threshing floor" in the open air, beneath the feet of the unmuzzled ox, or other animals, has prevailed among eastern nations from remote antiquity. This triturating process, however, appears from very early times to have been facilitated by certain instruments. Thus, "threshing instruments of iron" are mentioned by the prophet Amos; and "a new sharp threshing instrument having teeth," at a later period, by Isaiah. Smaller grains, having a less adhesive envelope, appear to have been separated by implements analogous to the flail, as elsewhere mentioned by the same prophet: "For the fitches are not threshed with a threshing instrument, neither is a cart-wheel turned about upon the cummin; but the fitches are beaten out with a staff, and the cummin with a rod." Cummin is threshed by the same mode in Malta at the present day, and in Syria may still be seen in common use the representative of the new sharp threshing instrument with teeth. It is described as a thick plank or sledge drawn by oxen, and having inserted upon its under surface pieces of stone, flint, or iron, projecting from three-quarters to half an inch, by which the ears of corn are torn asunder. Its more ancient form among the Hebrews was frequently that of a square frame with rollers, encircled by three rings or wheels serrated in the manner of a saw. It sometimes resembled in form a cart, by which name it is called in the passage quoted. The threshing floor of level, hard-rolled earth was sometimes covered so as to afford shelter to the laborers during harvest; as that of the wealthy Boaz, which has furnished so interesting an illustration of the simplicity of ancient manners and customs. It was usually constructed upon an elevation exposed to currents of wind, to carry off the chaff; as that of Ornan, the Jebusite, occupied the rocky eminence of Mount Moriah, and, with the threshing instruments and oxen, was purchased by David, to be forever honored as the site of the holy temple. Hesiod, who soon after wedded the muse to agriculture, directs the threshing floor to be so placed:

> "Smooth be the level floor on gusty ground,
> Where winnowing gales may sweep in eddies round."

That the threshing instruments employed had great mechanical effect upon the sheaves over which they were drawn may be inferred from their frequent use in the imagery of the prophets as descriptive of violence and ruin. The *tribula*, as the same implement was called by the Romans, has furnished our language with a synonym for the worst forms of affliction.

It is uncertain at what time the flail was first introduced. But it was in common use among the Romans, and throughout the greater part of the empire, as well as among most nations of modern Europe, for several centuries superseded nearly every other implement. This highly efficient but tedious and laborious instrument still holds its place upon small farms, and for certain kinds of crops upon large ones, in Great Britain and America. There are few, whose privilege it is to have been born in the country, who are not familiar with an article pleasantly associated with the rural literature and experience of ancient and modern times.

The earliest attempt on record to produce an implement of the character of the modern threshing-machine was made toward the middle of the last century.

The genius of mechanics appears about that time to have suddenly invaded the domain of rural economy. The horse-hoe, the drill-plow, and many other valuable contributions, were made by it to the labor of the farm and the fireside. In place of the spinning-wheel and distaff, it supplied the spinning mill and the jenney. The threshing floor of clay, the trampling of oxen, and the flail of the thresher—

> "Sweating over his bread
> Before he eats it; the primal curse;
> But softened into mercy, made the pledge
> Of cheerful days and nights without a groan"—

it sought to replace by the threshing-machine. For the dash of the water-wheel and the moil of men and brutes it substituted the Briarean arms and tireless energy of the steam-engine. These and a thousand other substitutions in agricultural and general mechanics, if less picturesque than the objects they have supplanted, have made ample amends by their pre-eminent service to mankind; and if mowing, reaping, and threshing machines shall ever have their protean forms arrested and fixed in a definite and recognizable shape, they may in time gather about them as many agreeable associations as their earlier and simple representatives—the scythe, the sickle, and the flail.

It is an interesting fact that as the first specific mention of the production of artificial light from coal gas was made nearly two hundred years ago in an historical account of Virginia, given to the Royal Society of England, by the Rev. John Clayton, of Yorkshire, so the earliest proposition on record, probably, to apply machinery, and perhaps water-power, to the threshing of grain, occurs in a work upon that colony of still earlier date. It is found in a tract published in London in 1650, by Ed. Williams. He urges a vigorous prosecution of the plan of colonization in that quarter, and states, among other reasons, that it would stimulate the invention of labor-saving engines, which were necessary to half-peopled plantations, but were regarded as aggressive monopolizers of labor in over-populous countries. He gives an "explication of the sawmill, an engine wherewith, by force of a wheel in the water, to cut timber with great speed." This mechanism he proposed to introduce into Virginia, and finishes his description of it by saying that the artificer might "easily convert the same to an instrument of threshing wheat, breaking of hemp or flax, and other as profitable uses." It does not appear that the machine was at that early period ever applied to any of those "profitable uses." A number of the first attempts, however, to construct threshing mills in this country were made in the Old Dominion.

We propose to glance at some of the early attempts to introduce this class of machinery upon American farms, and at some of the results of later invention, to show that our people have not been slow to appreciate the advantages of such mechanism, nor unsuccessful in supplying it. It is proper, however, before speaking of American machines, to look a little at what has been done in Great Britain, where they were first invented. Our own progress may thus be better understood.

The first person who ever projected a threshing-machine is said to have been the celebrated Jethro Tull, of Shelborne, in Berkshire, the inventor of the drill-plow, and the father of the horse-hoeing husbandry and of systematic agriculture in England, who died in 1740. In constructing an effective threshing-machine he was far from successful. His attempt was immediately followed by that of Michael Menzies, a Scotchman, belonging to the fertile grain district of East Lothian. His more successful machine, patented in 1732, is considered the initial instrument of its class. It consisted of a system of flails attached to a revolving cylinder, driven by a water-wheel, and was pronounced by a committee of the Society of Improvers, in Scotland, "of great use to farmers, both in threshing the grain clean from the straw and in saving a great deal of labor, for one man would be sufficient to manage a machine which would do the work of six." The next attempt appears to have been made about twenty years after, by Michael Sterling, who made a machine on a very different principle, that of the flax-hulling machine in common use. It was found to break off the heads, and to be only well adapted for threshing oats. In 1766, a machine, which could be moved either by horse or water power, and was said to thresh great quantities of corn in a short time, was presented to the London Society of Arts, by Mr. Evers, of Swillington, in Yorkshire, the inventor of a winnowing-machine deposited with the society.

Messrs. Alderton and Stewart, of Northumberland, in 1772, devised a machine, with an indented drum six feet in diameter and a number of fluted rollers, between which the grain was rubbed from the ear. "A mill for separating grain from straw," patented in 1785 by William Winlan, of Marylebone, was constructed upon the principle of the coffee-mill, and performed more than it promised by grinding as well as threshing the grain. The price of this machine was about £15, as appears from a letter of General Washington, dated November 1, 1787, to Arthur Young, in the sixth volume of whose Annals of Agriculture he had seen a cut and description of it. He requested Mr. Young to procure one, if he was able to recommend it and thought it sufficiently simple to be kept in order by common laborers. In a subsequent letter the General says he is convinced that a Scotch machine, described by his correspondent, was superior to Winlan's, and he concluded to wait a little before he procured one. Some other machines, constructed upon the rubbing principle, were found to damage the grain—an objection thought by some to lie against all machines when used for seed-wheat, and were laid aside.

In 1792 Mr. Willoughby, of Bedford, in Notts, returned to the system of flails introduced by Menzies, and constructed a machine with loose beaters attached to a horizontal axis or cylinder, turned rapidly by means of a horse-wheel and made to act upon a grated flooring. A Mr. Jubb, of Lewes, in 1795, also made a threshing-machine in which the straw was carried by feeding rollers between two rapidly revolving beaters, whence the corn fell into a winnowing-machine.

During the next year the model of a threshing-machine was presented to the Society of Arts of which we have no description. About the same time the description of a curious machine, worked by one horse, walking in a circle of forty feet and moving a cylinder upon which were placed thirty-two flails, making twenty revolutions to one of the horse wheel, was given to the same society. It did not prove to be an efficient agency.

In October of that year John Steadman, of Trentham, patented a machine having a number of flails fixed upon a rotary cylinder, while a circular table, revolving horizontally, brought the straw beneath their strokes. All the foregoing machines and a machine with flails, invented by J. Wardrop, of Virginia, introduced the same year in England, have long been regarded as nearly impracticable in principle.

The machine which was more properly the basis of those now in use in Scotland and elsewhere, was brought out in 1785, by Andrew Meikle, of Tyrringham, in East Lothian, through a gentleman named Stein, who had long seen the defect of the rubbing process and agreed with the son of Mr. Meikle to build him a perfect instrument. The machine was completed in 1786.

It introduced the corn between two rollers and threshed it by four beaters fixed upon a revolving drum. Previous to obtaining a patent, an improvement was made upon the original form of the beaters by substituting for a flat surface a comparatively sharp edge, thus "scutching out the grain," as he termed it, by acting in the direction of the ear, a modification not easily explained without a cut. The inventor, according to Sir John Sinclair, received substantial evidence of the gratitude of his countrymen, whose "voluntary donations" made a comfortable provision for his old age and for his family after him. Professor Low remarks, that "to Andrew Meikle, beyond a question, belongs the honor of having perfected the threshing-machine," although many changes have since been made in many parts. It was probably the instrument referred to in the letter of General Washington.

In 1789 the first machine with a rake and fan attached, to perfect the cleaning of the grain, was invented, it is believed, by J. Bailey, of Chillingham. In 1795 Mr. Wigfall, of Lynne, patented some improvements, in which he attempted to combine the stroke of the flail with revolving beaters. The latter were loosely attached by short bits of chain instead of being fixed, as in Meikle's scutchers. The grain was carried to the fan by a shaking screen and rolling cloth on an endless arch.

About the year 1800 or 1801 the Society of Arts first offered a premium of thirty guineas or a gold medal for a threshing-machine. The medal was accordingly adjudged by the society, in 1810, to H. P. Lee, Esq., of Maidenhead Thicket, who, finding the machines then in use so complicated, inefficient, and liable to get out of order, had one constructed under his own directions, which was highly commended for its simplicity and effectiveness. In it rollers were first dispensed with for feeding the straw to be threshed. It was three feet in diameter and two and a half feet in length, and, with two horses, would thresh about twelve bushels in an hour. It consisted of four vanes or beaters, fixed to an axis revolving within a drum or cylinder, formed of iron plates grooved or ribbed parallel to the axis, and connected by wooden curbs so as to admit of being placed nearer or further from the beaters, according to the kind of grain to be threshed. It was made at a cost, including the horse-wheel by which it was carried, of £40. It was subsequently improved by Mr. William Lester, of Paddington. Another invention called the bolting-machine, afterwards much improved by R. Garrett & Son, of Leicester, was highly spoken of at a later period. A patent was taken out in England over twenty years ago by Joseph Atkinson, of Braham Hall, Yorkshire, for a machine said to have been previously patented in this country by S. Turner, of New York.

Many other threshing machines of various degrees of merit were introduced in Great Britain during the first half of this century. Hand threshing-machines were quite common, and received several improvements by Ransom and other large manufacturers. The machines in use in Scotland twenty years ago were generally on the principle of Meikle's, and combined all the later improvements. Those in use in the eastern parts of England were generally portable threshers, without rakes or fanners attached.

There was much difference in the performance of different machines. A machine erected for J. Hanning, Esq., of Dorset, about 1801, would thresh, clean, and sack, it was said, in twelve hours, with the assistance of five men, four-hundred bushels of grain. A report on the Scotch machines in 1796 states that those carried by water, or four horses, would generally thresh from one hundred and fifty to one hundred and eighty bushels per diem. Arthur Young states in a report of Norfolk, in 1804, that machines built by Wigfall cost from £120 to £210, and worked by six or seven men and four to six horses, would thresh in a day, of wheat, from eighty to one hundred and sixty bushels; of barley, one hundred and twenty to two hundred and fifty-six; and of oats or peas, from one hundred and sixty to three hundred and twenty bushels. The only threshing mill in use in Kent, in 1805, R. Boy's, had by many improvements and alterations been brought to work extremely well. Operated by four horses and twelve men, it would thresh, of wheat one hundred and ninety-two bushels, of barley two hundred and fifty-six, and of oats three hundred and twenty bushels daily. A machine of R. Kerr's, described by Sir John Sinclair in 1812, would with six horses, four men, and four women, thresh about three hundred bushels of wheat in a day, at a saving of one-half the expense of the ordinary mode of threshing. Steam was applied to the business of threshing upon the example farm of Lord Ducie, at Whitfield, where a machine with some valuable modifications was constructed under the directions of his manager, John Morton, and was driven by an engine of six-horse power.

Thus it is apparent that considerable skill and enterprise had been expended upon this class of machines at an early period in the present century. Although tolerably successful, the inventors do not appear to have as yet produced instruments devoid of considerable complication and expense, both in the construction and working of them, which would preclude their general use on farms of moderate size. The early attempt to introduce from abroad into the United States, did not, on these accounts, meet with much success. Their high cost, complexity, and liability to get out of order, as well as the amount of horse power and manual assistance required, were objections which led many to doubt the utility of such machines upon American farms.

The flail, therefore, and the primitive system of treading out grain by cattle, continued in use as the favorite modes during many years of the present century. The former prevailed in most of the northern States, while in parts of Pennsylvania, in Delaware, the eastern shore of Maryland and Virginia, and, we believe, in Rhode Island, grain was generally trodden out by oxen or horses as the more expeditious method. Horses were preferred for this work. A crop of 3,000 bushels could thus be threshed and secured from "the best laid schemes of mice and men" in ten days, which would employ five threshers with the flail for one hundred days. The treading floors were from forty to one hundred and thirty feet, more commonly sixty to one hundred feet in diameter, with a path twelve to fourteen feet wide near the periphery upon which the grain was laid. The horses were led round at a slow trot, in platoons equidistant from each other, so that four ranks could preserve the distance of one-fourth of a circle and represent the four cardinal points. The floors were sometimes removed from field to field, but permanent floors made hard and smooth, and kept so by careful use, were preferred. They were commonly fenced round, sometimes with an outer and inner fence.

Toward the end of the last century Mr. Benjamin Sylvester, of Caroline county, Maryland, introduced the use of a roller to be attached to the horses upon the treading floor. It consisted of a good piece of white oak six and one-half feet long by twelve to fifteen inches square, which was reduced to an octagon or eight square, and encircled at each end with an iron ring, and had an iron axis in each end. Each of the eight planes were bored with about a dozen two-inch holes, in which were inserted stout pegs of oak, alternating with those in the next row, and made shorter at one end of the roller than the other to fit them for running in a circle This appendage to the threshing floor cost about twelve dollars, and drawn by three horses, with four men to turn the straw, would thresh a floor of thirty bushels in favorable weather in two hours, or from sixty to eighty bushels in a day. It was introduced into Kent county, Delaware, by Judge John Clayton, who, after an experience of over twenty years in preparing for market an annual crop of five hundred to eight hundred bushels of wheat, and as many of oats, considered it superior to any other known mode of threshing. George Cummins, Esq, a senator from that county and a large farmer, continued its use for the same length of time, and with Mr. Nicholas Ridgely, of Dover, whose account of it was published in the memoirs of the Philadelphia Society for Promoting Agriculture in 1816, and other experienced farmers, concurred in the opinion of Mr. Clayton. Although a Scottish threshing-machine was about that time introduced into some parts of the State, the wheat from Kent county was all threshed in the manner above described, and was said to be more sought after and to bring a better price at Wilmington than any other.

A good threshing machine of moderate cost was a desideratum, however, with the mass of farmers, and as the Scotch machines were expensive, the attention of American farmers and mechanics had been long turned to the construction of an instrument adapted to the circumstances of the country. An effort in this direction appears to have been made before the revolution. In the Pennsylvania Magazine or American Monthly Museum, vol. 1, for 1775, is a plate and description of a threshing-machine constructed with some improvements after a mode shown by Mr. Ferguson in his lectures in London. In the account of it the maker is said to have heard of machines for threshing grain erected in America, but had never seen or heard a description of them. We have met with no other reference to such inventions in this country during the colonial period. We find our mechanics, however, immediately upon the organization of the Patent Office, prepared to put on record their inventions in this line, and it is probable some of them may have been made much earlier.

The first patent issued by the Secretary of State for a threshing-machine, was dated March 11, 1791, being the seventh on the records of the office. It was to Samuel Mulliken, of Philadelphia, who on the same day received letters patent or machines for breaking and swinging hemp, for cutting and polishing marble, and for raising a nap on cloth, &c., all of which could scarcely have fallen ready armed and equipped for use from his fertile brain. On the second of August of the same year another patent was recorded for a threshing-machine by William Thompson, of Virginia. In the following year Colonel Alexander Anderson, of Philadelphia, an extensive distiller who made some important improvements in the application of steam to his own branch of manufacture, endeavored to supply the desideratum of a threshing-machine. His machine, a model of which was deposited with the American Philosophical Society, was not patented. But one erected upon its plan in Maryland was found to answer well. After a time the wheel warped so as to impede its action, and from want of confidence or energy in the owner, and the absence of the inventor, it was laid aside.

In 1794 two patents for threshing-machines were taken out by Virginians—one dated April 28, by William Hodgson, and the other November 5, by James Wardrop, of Ampthill, in that State. Wardrop's machine, as already mentioned, was introduced in England in 1796. It was made with flails or elastic rods twelve feet in length, of which twelve were attached in a series having each a spring requiring a power of twenty pounds to raise it three feet high at the point. A wallower shaft with catches or teeth, in its revolution successively lifted each flail in alternate movements, so that three of the flails were operated upon by the whole power, viz: twenty pounds. The whole weight to be overcome was one hundred and twenty pounds, and the machine was worked by two men. The flails beat upon a grating, to which the corn to be threshed was fed by hand. We cannot say what success it met with in England.

Patents were taken out in March, 1797, by William Booker, also of Virginia, and in November by Richard B. Elliott, of Massachusetts, who were followed in June, 1798, by Thomas C. Montin, who patented a threshing-machine, making nine inventions of that kind in eight years. The next machine brought before the public was that of Christopher Hoxie, of Hudson, New York, patented August 20, 1801. It was considered more promising than any of its predecessors, but did not come into general use.

During the year 1802 a Mr. Prentiss, from Edinburg, erected in Pennsylvania, New Jersey, and Delaware, six or seven machines upon the Scotch principle, which were found to answer well. But on account of the extreme care required in feeding them and the inability of common workmen to keep them in repair, the builder being engaged in another business at a distance, prevented their general adoption. The increased demand for American breadstuffs in Europe during the continental wars, and the impulse given to American agriculture about this time, produced frequent attempts to project a threshing-machine adapted to general use. In July of this year two patents were issued for threshing and cleaning grain—one to Ezekiel Miller, of New York, and one to Joseph Pope, of Boston, afterwards of Hallowell, Maine, a very ingenious mechanic and the inventor of an orrery which was purchased by Harvard College. Twenty years after, and four years before his death, Pope received another patent for a machine for the same purpose. In October, 1803, J. F. Turner, of Delaware, followed with a threshing-machine, and during the following year patents were issued to Thomas Barnatt, of Philadelphia, for threshing and cleaning grain; to Samuel Houston, of Virginia, for the Columbian threshing, break, and cleaning fan; and to James Deneale, of Dumfries, in the same State, for an improvement in threshing-machines. B. B. Bernard, of Virginia, and Simon Willard, jr., of Hudson, New York, took patents in 1807, the former for a simple thresher, and the latter for threshing and cleaning. But one patent was given in 1808, four in 1809, and six in 1810, for threshing and cleaning grain, including one by Isaiah Jennings, of Brookfield, New York, the inventor of the patent burning fluid so extensively used in late years.

The number of threshing-machines patented during the next twenty-five years, including those which combined other operations and horse power, was over 240, or nearly ten annually upon an average.

In 1815 the trustees of the Massachusetts Society for Promoting Agriculture offered, among others, a premium of one hundred dollars for the most approved machine for threshing and separating grain, adapted to a farm of medium size, to be claimed before the first of June, 1816. In the summer of the last-mentioned year a Mr. Dumbleton, from England, introduced in the Middle States a threshing-machine which was thought at the time to supply all that was desirable. He erected one at Port Penn, Delaware, which gave complete satisfaction. It was speedy, clean in its threshing, easy of management, and portable. We have not seen a full description of it.

A machine patented by Seth Ballou, of Livermore, in Maine, in 1821, was the subject of patented improvements by Messrs. Boyd and Ketchum, of Pennsylvania, in 1825, by the inventor in 1826, and by George Jessup, of Troy, New York, in 1830. During the latter year the large number of thirty-four patented inventions connected with the threshing of grain were recorded, and in the following year thirty-eight—the largest number in any year of the period before mentioned. Many of our most ingenious mechanics exercised their skill upon these machines, including Moses Pennock, of Kennett Square, Pennsylvania, the inventor of the revolving horse-rake, Jacob Perkins, the inventor of the machine for cut nails, and numerous others. Pennock patented a vibrating thresher in May, 1827. A machine patented in January, 1831, by Samuel Turner, of Aurelius, New York, was, a few years after, patented in England by a Mr. Atkinson, of Yorkshire. It appears to have been upon the principle of those now in use, having a drum surrounded by a series of pegs so arranged as to pass a similar row of pegs placed on a concave, surrounding nearly one-half the circumference of the drum.

In the year 1831 two patents were issued for horse power for threshing-machines to N. P. Stanton, of Syracuse, New York, and to John Lammon, of Macedonia, in that State. These, which now form an important branch of the business of the manufactures of agricultural machinery, have been the subject of 147 patents up to 1857.

The great exhibition in London, in 1851, gave an immense impulse to the use and construction of agricultural machines in England and America. Europe was on that occasion first made acquainted with the extent and excellence of American inventions in this department, in which our greatest triumphs were achieved. A great variety of threshing-machines were there exhibited, adapted to steam and horse power. All the English horse-power machines required from four to eight horses to work them. Only one, which was exhibited by the Messrs. Allen, of New York, was operated by a single horse.

New York manufacturers have shown much enterprise in the department of rural mechanics. In July, 1852, under the direction of the executive committee of the New York State Agricultural Society, an extended and thorough trial of agricultural implements, lasting eight days, was made at Geneva, before a select committee. Trials were on that occasion made of simple threshers entered by Messrs. Emory & Co., of Albany, George Westinghouse, of Central Bridge, Eddy & Co., of Union Village, Ezra W. Badger, of Fly Creek, and George F. Jerome, of Hempstead. The Messrs. J. A. Pitts, of Buffalo, Harris Scovill, of Tompkins county, Daniel Woodbury, of Palmyra, J. Rapalje & Co., of Rochester, and Hall & Thompson, of Rochester, exhibited threshers and separators combined. Nearly all of this large number from a single State were found to be highly efficient machines. One of the largest of them was found to be capable of threshing and cleaning, with eight horses and seven men, 250 bushels of grain in a day, at a cost of four cents and seven mills per bushel. A less efficient machine, requiring double the time to perform the same work, would thresh, without cleaning, 135 bushels, with the aid of five men and two horses, at a cost of four cents and four mills per bushels. The balance of economy generally was found to be in favor of the large machines. The price of the large machine was $150, and of the smaller but $35. Of nine competing machines the price of three was $150; of one, $145; of two, $40; and of three, $35 each.

The horse power exhibited by the same manufacturers was also subjected to careful tests. They were both upon the chain or railroad principle, and upon that of the sweep or lever, and cost about $100 each.

We thus perceive what an immense gain had been effected in the economy of threshing over the most approved methods and instruments in use in England and America only forty or fifty years before.

The World's Fair in New York, in 1853, brought together also splendid illustrations of the progress of the United States in the application of mechanics to the business of the farm. There was a good representation of threshing-machines, of which the following were the principal, which may be supposed to exhibit the highest perfection which the instrument had then attained:

The "Farmer's Labor-saving Machine," for threshing, separating, cleaning, and bagging grain, ready measured for the market, at one operation, was designed for two horses, and was said to be capable of threshing and cleaning 100 bushels per day. It was patented in June, 1848, by E. S. Snyder, of Charlestown, Virginia, who also exhibited the model of another thresher with an upright cylinder.

The rotary seed and grain thresher, with revolving flails, invented by R. W. Palmer, of North Carolina, possessed some new features; and a machine on the old spiked cylinder plan, exhibited by the same manufacturer, contained several improvements. Mr. Palmer took out a patent in England in 1853, and in the United States the next year.

Hathaway's combined threshing, hulling, and cleaning machine for all kinds of grain and seeds, patented in 1848 by Bradford G. H. Hathaway, of Yates county, New York, was said by the inventor to be capable of threshing and cleaning 600 to 800 bushels of wheat in a day.

Gilbert's excelsior thresher and cleaner, patented by Joseph C. Gilbert, of New York, possessed some peculiarities in the construction of the cylinder, for which superiority to all others was claimed. A No. 3 machine of this patent, costing $110, would thresh and clean, it was said, with two horses, 1,000 to 1,200 bushels of wheat in a day.

The improved threshing and separating machine, patented by J. R. Moffit, of Piqua, Ohio, differed in many respects from any other. It was a powerful machine, with much complicated but ingenious mechanism.

Moffit's machine was introduced in England soon after the New York exhibition. It was put in operation upon the farm of Mr. Mechi, at Tiptree Hall, in Essex, and driven by a steam power of four horses, and threshed 256 bushels of wheat in four hours, cleaning it in perfect readiness for the market. Of barley it afterwards threshed 56 quarters or 448 bushels in six hours, turning out the grain clean and ready for malting or sale; it turned out 10 quarters in 73 minutes, and outstripped all the exertions of the feeders. Its weight was 12½ hundred-weight without wheels and driving gear, and cost in America $115.

During the Paris exhibition, a trial of mowing, reaping, and threshing machines was made about thirty miles from Paris, which attracted a great concourse from the capital. A correspondent of the *New York Tribune* says: "Six men were set to threshing with flails at the same moment that the different machines commenced operations, and the following were the results of half an hour's work:

| | | |
|---|---|---|
| "Six threshers with flails | 60 | litres of wheat. |
| Pitt's American thresher | 740 | " " |
| Clayton's English thresher | 410 | " " |
| Dunoir's French thresher | 250 | " " |
| Pinet's Belgium thresher | 150 | " " " |

In regard to Pitt's machine the *Moniteur* says: "Pitt's machine has, therefore, gained the honors of the day. This machine literally devours the sheaves of wheat; the eye cannot follow the work which is effected between the entrance of the sheaves and the end of the operation.

"It is one of the greatest results which it is possible to obtain.

"The impression which this spectacle produced upon the Arab chiefs was profound."

The *Moniteur* might have added that the effect was no less wonderful to the Prince Napoleon, who returned twice to the machine, and declared that it was "frightful to look at," as it must have been to all those who never before saw a genuine, fast American thresher.

The machine of Dunoir is used almost exclusively in France, but already the demand for the Buffalo machine is so great that without doubt it will supersede all others.

A machine by G. F. S. Zimmerman, of Virginia, the patentee, combined operations for threshing, separating, cleaning twice, screening, and bagging all kinds of small grain at one and the same time. For this machine it was claimed that with six or eight horses it would prepare for the mill 300 to 600 bushels of wheat, and with twelve horses and as many men 800 to 1,000 bushels, in a day.

Mr. R. L. Allen, of New York, and perhaps other manufacturers also, exhibited threshing-machines, and the Messrs. Von Brocklin, Winter & Co., of Branford, Canada East, sent a machine of their invention and manufacture, having some resemblance to Moffit's, and which had the appearance of being simple, strong, and efficient.

The portable steam-engines for farm purposes began, about twenty years ago, to be advocated by the Royal Agricultural Society of England, and are now in very general use. They travel, with or without threshers attached, from farm to farm, to do the threshing and other work. They are from three to eight or ten horse power, and consume about one hundred-weight of coals per diem for each horse power. One of the smallest size named will thresh 20 quarters or more daily.

Most of the large farms in England and Scotland have also fixed steam-engines of four to ten horse power, for threshing and other uses. Their average cost in 1844 was about $600 each, but is now much reduced.

By the use of steam and improved threshing-machines the crop is now threshed in the field in about the same time it would take to remove it to the barn.

Steam-engines and steam-threshers have within a few years been introduced in Ohio and other parts of the West.

A machine of about ten-horse power was several years ago built at Chillicothe, Ohio, and was employed in threshing grain in the fields of the farmers. With three men accompanying it, and some assistance from the farm hands, it did the work of seventy flails, threshing about 100 bushels an hour, or 700 bushels in a day.

It was estimated that the counties of Ross and Pickaway, in Ohio, would require thirty steam-threshers to prepare for market an average wheat crop, the united savings of which would be equal to the labor of forty thousand men.

The immense importance of the threshing-machine with steam as a motive power, as well to the grain-grower as to the manufacturer, when they shall have been more generally introduced throughout our extended country, may be readily inferred. To the farmer, in enabling him to take advantage of any sudden rise in the price of grain, and to secure it from mischances by fire, weather, or otherwise, its value is very apparent.

Messrs. Hoard & Brodferd, of Watertown, New York, were among the first in this country to manufacture steam-engines for farm use. The specimens exhibited by them at the World's Fair in London were, perhaps, not inferior in merit to the best of a large collection.

*New domestic animals.*—Camels and Cashmere goats have been successfully introduced, and strong hopes are entertained of their perfect acclimation and permanent utility. Italian bees have also been brought into the country, and are believed to possess many advantages over the common black variety.

*Associations and exhibitions.*—Among the means and incentives to improvement enjoyed by the farming community we cannot overlook the influence of associations and annual exhibitions. These are not new, but they prove none the less useful, are now established in most of the States, and in almost every county of some of them. A somewhat new and important application of the association principle has been made in many towns and neighborhoods by the organization of local societies or *farmers' clubs.* The great advantage of these township associations consists in their adaptation to bring agricultural improvement home to all the people.

*Agricultural schools and colleges.*—But few agricultural schools are in successful operation, although several have been established. New York, Pennsylvania, Maryland, Michigan, and Iowa, have each one, and one or more are about to be established in other States. It does not argue well for the agricultural taste of our people, that while we are in advance of most European countries in the number of our common schools and colleges, we are greatly behind some of them in institutions designed to teach the innumerable applications of science to agriculture, and to elevate and throw a charm around this noble employment.

*Periodicals.*—The number and excellence of agricultural and horticultural periodicals leave little to be desired except that some of them were in the hands of every farmer. Forty papers and magazines, devoted almost exclusively to topics pertinent to farming and gardening, are published in the country.

*Diseases of animals.*—Among the embarrassments which still interfere seriously with farming operations are the diseases of domestic animals. Two forms of disease have more especially attracted attention—the pleuro-pneumonia of neat cattle in Massachusetts, and what is known as hog-cholera in the Western States. In reference to the former, the people of the whole Union have incurred a heavy debt of gratitude to the State in which it first appeared, for the prompt and energetic measures adopted to prevent its diffusion. The disease which prevailed among swine caused great destruction, and unfortunately but small success attended any efforts devised to arrest its progress.

These visitations, with others of more common occurrence, cannot fail to suggest the necessity of a class of well-educated veterinary surgeons. In this particular most European countries are greatly in advance of the United States. It is believed there is nothing about the rural economy of the Old World from which we may so profitably learn a lesson as in securing skillful medical and surgical treatment for domestic animals This necessity has been made still more apparent by recent losses of army horses. We are of the opinion that the country, in the purchase and loss of horses during the insurrection, has incurred expenses already which, under other circumstances, could have been avoided, to an amount greater than would have been required to maintain a national veterinary school or college on an extended scale for half a century. In truth, we are not sure that the interest on the amount lost would not permanently support such an institution. The multiplication and cost of insurances on live stock furnishes proof of the little reliance placed on the skill of the professed cattle and horse doctor.

*Destructive insects*—In many instances whole armies of destructive insects have rendered the labors of the husbandman unprofitable or fruitless. The wheat midge, the chinch bug, and the army worm, besides those that have for years preyed on the products of the orchard and garden, occasion the loss of millions of dollars annually. By the labors of entomologists we have been taught to know these enemies more fully, and led to cherish the hope that we shall yet learn how to protect our crops from their ravages.

*Meteorological observations.*—The want of meteorological knowledge, and consequent want of adaptation of our industry to the laws of climate, both general and local, is a frequent source of loss to the farmer.

Through the system of meteorology inaugurated by the Surgeon-General of the United States army, and that now efficiently carried on by the Smithsonian Institution, the climate of the United States will soon be as well understood as its geology or geography. When the knowledge thus obtained is thoroughly popularized, we may expect to see it beneficially applied.

For information respecting agricultural products, not referred to in the foregoing notes, the reader is referred to the tables of agriculture appended to the report. The great labor required in the preparation of tables involving such vast interests and varied details has precluded their completion prior to the moment when it becomes necessary to submit them to the printer, a circumstance which is sufficiently explanatory of what some may be disposed to consider a meagre commentary upon a matter of so great importance.

It is not improbable that some inconsiderable errors may be detected in the foregoing notes, attributable to the tables having in some cases been slightly varied after their adoption as the text for comment. It is confidently believed, however, that no material error or discrepancy will be found to exist in any part of the report.

**The following tables are from an advance copy of a Preliminary Report of the census for 1860, kindly furnished me by J. C. G. KENNEDY, the Superintendent of that Bureau.**

**KLIPPART.**

## *Productions of Agriculture for* 1850 *and* 1860.

| STATES. | LANDS IMPROVED. | | LANDS UNIMPROVED. | |
|---|---|---|---|---|
| | 1850. | 1860. | 1850. | 1860. |
| | Acres. | Acres. | Acres. | Acres |
| Alabama | 4,435,614 | 6,462,987 | 7,702.067 | 12,687,913 |
| Arkansas | 781,530 | 1,933,036 | 1,816,684 | 7,609,938 |
| California | 32,454 | 2,430,882 | 3,861,531 | 6,533,858 |
| Connecticut | 1,768,178 | 1,830,808 | 615,701 | 673,457 |
| Delaware | 580,862 | 637,065 | 375,282 | 367,230 |
| Florida | 349,049 | 676,464 | 1,246,240 | 2,273,008 |
| Georgia | 6,378,479 | 8,062,758 | 16,442,900 | 18,587,732 |
| Illinois | 5,039,545 | 13,251,473 | 6,997,867 | 7,993,557 |
| Indiana | 5,046,543 | 8,161,717 | 7,746,879 | 8,154,059 |
| Iowa | 824,682 | 3,780,253 | 1,911,382 | 5,649,136 |
| Kansas | ............ | 372,835 | ............ | 1,284,626 |
| Kentucky | 5,968,270 | 7,644,217 | 10,981,478 | 11,519,059 |
| Louisiana | 1,590,025 | 2,734,901 | 3,399,018 | 6,765,879 |
| Maine | 2,039,596 | 2,677,216 | 2,515,797 | 3,023,539 |
| Maryland | 2,797,905 | 3,002,269 | 1,836,445 | 1,833.306 |
| Massachusetts | 2,133,436 | 2,155,512 | 1,222,576 | 1,183,212 |
| Michigan | 1,929,110 | 3,419,861 | 2,454,780 | 3,511,581 |
| Minnesota | 5,035 | 554,397 | 23,846 | 2,222,734 |
| Mississippi | 3,444,358 | 5,150,008 | 7,046,061 | 11,703,556 |
| Missouri | 2,938,425 | 6,246,871 | 6,794,245 | 13,737,938 |
| New Hampshire | 2,251,488 | 2,367,039 | 1,140,926 | 1,377,591 |
| New Jersey | 1,767,991 | 1,944,445 | 984,955 | 1,039,086 |
| New York | 12,408,964 | 14,376,397 | 6,710,120 | 6,616,553 |
| North Carolina | 5,453,975 | 6,517,284 | 15,543,008 | 17,245,685 |
| Ohio | 9,851,493 | 12,665,587 | 8,146,000 | 8,075,551 |
| Oregon | 132,857 | 895,375 | 299,951 | 5,316,817 |
| Pennsylvania | 8,623,619 | 10,463,306 | 6,294,728 | 6,548,847 |
| Rhode Island | 356,487 | 329,884 | 197,451 | 189,814 |
| South Carolina | 4,072,551 | 4,572.060 | 12,145.049 | 11,623 860 |
| Tennessee | 5,175,173 | 6,897,974 | 13,808,849 | 13,457,960 |
| Texas | 643,976 | 2,649,207 | 10,852,363 | 20,486,990 |
| Vermont | 2,601,409 | 2,758,443 | 1,524,413 | 1,402,396 |
| Virginia | 10,360,135 | 11,435,954 | 15,792,176 | 19,578,946 |
| Wisconsin | 1,045,499 | 3,746,036 | 1,931,159 | 4,153,134 |
| Total States | 112,833,813 | 162,804,521 | 180,361,927 | 244,428,549 |
| TERRITORIES. | | | | |
| Columbia, District of | 16,267 | 17,474 | 11,187 | 16,789 |
| Dakota | ............ | 2,115 | ............ | 24,333 |
| Nebraska | ............ | 122,582 | ............ | 501,723 |
| New Mexico | 166,201 | 149,415 | 124,370 | 1,177,055 |
| Utah | 16,333 | 82,260 | 30,516 | 58,898 |
| Washington | ............ | 83,022 | ............ | 300,897 |
| Total Territories | 198,801 | 456,868 | 166,073 | 2,079,695 |
| Aggregate | 113,032,614 | 163,261,389 | 180,528,000 | 246,508,244 |

## *Productions of Agriculture for* 1850 *and* 1860—Continued.

| STATES. | CASH VALUE OF FARMS. | | VALUE OF FARMING IMPLEMENTS AND MACHINERY. | |
|---|---|---|---|---|
| | 1850. | 1860. | 1850. | 1860. |
| | Dollars. | Dollars. | Dollars. | Dollars. |
| Alabama | 64,323,224 | 172,176,168 | 5,125,663 | 7,287,599 |
| Arkansas | 15,265,245 | 91,673,403 | 1,601,296 | 4,024,114 |
| California | 3,874,041 | 46,571,994 | 103,483 | 2,443,297 |
| Connecticut | 72,726,422 | 90,830,005 | 1,892,541 | 2,339,481 |
| Delaware | 18,880,031 | 31,426,357 | 510,279 | 817,883 |
| Florida | 6,323,109 | 16,371,684 | 658,795 | 888,930 |
| Georgia | 95,753,445 | 157,072,803 | 5,894,150 | 6,844,387 |
| Illinois | 96,133,290 | 432,531,072 | 6,405,561 | 18,276,160 |
| Indiana | 136,385,173 | 344,902,776 | 6,704,444 | 10,420,826 |
| Iowa | 16,657,567 | 118,741,405 | 1,172,869 | 5,190,042 |
| Kansas | .............. | 11,394,184 | .............. | 675,336 |
| Kentucky | 155,021,262 | 291,496,955 | 5,169,037 | 7,474,573 |
| Louisiana | 75,814,398 | 215,565,421 | 11,576,938 | 20,391,883 |
| Maine | 54,861,748 | 78,690,725 | 2,284,557 | 3,298,327 |
| Maryland | 87,178,545 | 145,973,677 | 2,463,443 | 4,010,529 |
| Massachusetts | 109,076,347 | 123,255,948 | 3,209,584 | 3,894,998 |
| Michigan | 51,872,446 | 163,279,087 | 2,891,371 | 5,855,642 |
| Minnesota | 161,948 | 19,070,737 | 15,981 | 1,044,009 |
| Mississippi | 54,738,634 | 186,866,914 | 5,762,927 | 8,664,816 |
| Missouri | 63,225,543 | 230,632,126 | 3,981,525 | 8,711,508 |
| New Hampshire | 55,245,997 | 69,689,761 | 2,314,125 | 2,682,412 |
| New Jersey | 120,237,511 | 180,250,338 | 4,425,503 | 5,746,567 |
| New York | 554,546,642 | 803,343,593 | 22,084,926 | 29,166,565 |
| North Carolina | 67,891,766 | 143,301,065 | 3,931,532 | 5,873,942 |
| Ohio | 358,758,603 | 666,564,171 | 12,750,585 | 16,790,226 |
| Oregon | 2,849,170 | 14,765,355 | 183,423 | 949,103 |
| Pennsylvania | 407,876,099 | 662,050,707 | 14,722,541 | 22,442,842 |
| Rhode Island | 17,070,802 | 19,385,573 | 497,201 | 587,241 |
| South Carolina | 82,431,684 | 139,652,508 | 4,136,354 | 6,151,657 |
| Tennessee | 97,851,212 | 272,555,054 | 5,360,210 | 8,371,095 |
| Texas | 16,550,008 | 104,007,689 | 2,151,[illegible]04 | 6,114,362 |
| Vermont | 63,367,227 | 91,511,673 | 2,739,282 | 3,554,728 |
| Virginia | 216,401,543 | 371,696,211 | 7,021,772 | 9,381,008 |
| Wisconsin | 28,528,563 | 131,117,082 | 1,641,568 | 5,758,847 |
| Total States | 3,267,879,245 | 6,638,414,221 | 151,385,170 | 246,125,065 |
| TERRITORIES. | | | | |
| Columbia, District of | 1,730,460 | 2,989,267 | 40,220 | 54,410 |
| Dakota | .............. | 97,335 | .............. | 15,574 |
| Nebraska | .............. | 3,916,002 | .............. | 180,082 |
| New Mexico | 1,653,922 | 2,701,626 | 77,960 | 194,005 |
| Utah | 311,799 | 1,637,854 | 84,288 | 255,854 |
| Washington | .............. | 1,116,202 | .............. | 202,506 |
| Total Territories | 3,696,181 | 12,458,286 | 202,468 | 902,431 |
| Aggregate | 3,271,575,426 | 6,650,872,507 | 151,587,638 | 247,027,496 |

| STATES. | LIVE STOCK. | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Horses. | | Asses and mules. | | Milch cows. | | Working oxen. | |
| | 1850. | 1860. | 1850. | 1860. | 1850. | 1860. | 1850. | 1860. |
| | Number. | Number. | Num'r. | Number. | Number. | Number | Number | Number. |
| Alabama...... | 128,001 | 127,205 | 59,895 | 108,701 | 227,791 | 234,045 | 66,961 | 92,495 |
| Arkansas..... | 60,197 | 101,249 | 11,559 | 44,158 | 93,151 | 158,873 | 34 239 | 70,944 |
| California .... | 21,719 | 160,395 | 1,666 | 13,744 | 4,280 | 198,859 | 4,780 | 31,527 |
| Connecticut... | 26,879 | 33,276 | 49 | 82 | 85,461 | 98,877 | 46,988 | 47,939 |
| Delaware .... | 13,852 | 16,562 | 791 | 2,294 | 19,248 | 22,595 | 9 797 | 9,530 |
| Florida........ | 10,848 | 13,424 | 5,002 | 10,909 | 72,876 | 92,704 | 5,794 | 7,787 |
| Georgia...... | 151,331 | 130,771 | 57,379 | 101,069 | 334,223 | 299,688 | 73,286 | 74,487 |
| Illinois........ | 267,653 | 575,161 | 10,573 | 38,881 | 294,671 | 532,731 | 76,156 | 90,973 |
| Indiana....... | 314,299 | 409,504 | 6,599 | 18,627 | 284,554 | 491,033 | 40,221 | 95,982 |
| Iowa.......... | 38,536 | 174,957 | 754 | 5,713 | 45,704 | 188,546 | 21,892 | 56,563 |
| Kansas...... | ........ | 18,882 | ..... | 1,430 | ......... | 26,726 | ....... | 20,133 |
| Kentucky .... | 315,682 | 355,704 | 65,609 | 117,635 | 247,475 | 269,215 | 62,274 | 108,999 |
| Louisiana..... | 89,514 | 79,068 | 44,849 | 92,259 | 105,576 | 130,672 | 54,968 | 61,008 |
| Maine ........ | 41,721 | 60,638 | 55 | 104 | 133,556 | 147,315 | 83,893 | 79,792 |
| Maryland..... | 75,684 | 93,406 | 5,644 | 9,829 | 86,856 | 99,463 | 34,135 | 34,524 |
| Massachusetts.. | 42,216 | 47,786 | 34 | 108 | 130,099 | 144,492 | 46,611 | 38,221 |
| Michigan..... | 58,506 | 154,168 | 70 | 359 | 99,676 | 200,635 | 55,350 | 65,949 |
| Minnesota..... | 860 | 17,122 | 14 | 395 | 607 | 40,386 | 655 | 27,574 |
| Mississippi.... | 115,460 | 117,134 | 54,547 | 112,486 | 214,231 | 207,134 | 83,485 | 104,184 |
| Missouri...... | 225,319 | 361,874 | 41,667 | 80,941 | 230,169 | 345,243 | 112,168 | 166,588 |
| New Hampshire | 34,233 | 41,101 | 19 | 10 | 94,277 | 94,880 | 59 027 | 51,512 |
| New Jersey... | 63,955 | 79,707 | 4,089 | 6,362 | 118,736 | 138,818 | 12,070 | 10,067 |
| New York..... | 447,014 | 503,725 | 963 | 1,553 | 931,324 | 1,123,634 | 178,909 | 121,702 |
| North Carolina | 148,693 | 150,661 | 25,259 | 51,388 | 221,799 | 228,623 | 37,309 | 48,511 |
| Ohio ......... | 463,397 | 622,829 | 3,423 | 6,917 | 544,499 | 696,309 | 65,381 | 61.760 |
| Oregon... ... | 8,046 | 36,600 | 420 | 990 | 9,427 | 53,072 | 8,114 | 7,426 |
| Pennsylvania. | 350,398 | 437,654 | 2,259 | 8,832 | 530,224 | 673,547 | 61,527 | 60,371 |
| Rhode Island.. | 6,168 | 7,121 | 1 | 10 | 18,698 | 19,700 | 8,139 | 7,857 |
| South Carolina. | 97,171 | 81,125 | 37,483 | 56,456 | 193,244 | 163,938 | 20,507 | 22 629 |
| Tennessee.... | 270,636 | 289,548 | 75,303 | 119,221 | 250,456 | 247,105 | 86,255 | 104 495 |
| Texas........ | 76,760 | 320,621 | 12,463 | 63,000 | 217,811 | 598,086 | 51,285 | 172,243 |
| Vermont...... | 61,057 | 67,250 | 218 | 35 | 146,218 | 171,698 | 48,577 | 42,860 |
| Virginia...... | 272,403 | 287,522 | 21,483 | 41,014 | 317,619 | 330,627 | 89,513 | 97,862 |
| Wisconsin .... | 30,179 | 116,192 | 156 | 1,019 | 64,339 | 193,996 | 42,801 | 93,660 |
| Total States.. | 4,328,387 | 6,089,942 | 550,295 | 1,116,533 | 6,368,785 | 8,663 265 | 1,683,06. | 2,188,154 |
| TERRITORIES. | | | | | | | | |
| Colum., Dist. of | 824 | 641 | 57 | 122 | 813 | 639 | 104 | 69 |
| Dakota....... | ........ | 84 | ...... | 19 | ......... | 286 | ....... | 348 |
| Nebraska...... | ........ | 4,522 | ...... | 473 | ......... | 7,125 | ....... | 12,720 |
| New Mexico... | 5,079 | 10,119 | 8,654 | 11,255 | 10,635 | 34,461 | 12,557 | 26,104 |
| Utah ........ | 2,429 | 5,145 | 325 | 973 | 4,861 | 13,052 | 5,266 | 9,903 |
| Washington ... | ........ | 5,005 | ...... | 178 | ......... | 10,034 | ....... | 2,777 |
| Tot. Terr'ries | 8 332 | 25,516 | 9,036 | 13,020 | 16,309 | 65,597 | 17.627 | 51,921 |
| Aggregate... | 4,336,719 | 6,115,458 | 559,331 | 1,129,553 | 6,385,094 | 8,728,862 | 1,700,694 | 2,240,075 |

## *Agriculture for* 1850 *and* 1860—Continued.

### LIVE STOCK.

| Other cattle. | | Sheep. | | Swine. | | Value of live stock. | |
|---|---|---|---|---|---|---|---|
| 1850. | 1860. | 1850 | 1860. | 1850. | 1860. | 1850. | 1860. |
| Number | Number. | Number | Number | Number | Number. | Dollars | Dollars. |
| 433,263 | 452,643 | 371,880 | 369,061 | 1,904,540 | 1,[illegible]36,959 | 21,690,112 | 43,061,805 |
| 165 320 | 318,355 | 91,256 | 202,674 | 836,727 | 1,155,379 | 6,647,969 | 22 040,211 |
| 253,599 | 952,048 | 17,574 | 1,075,718 | 2 776 | 453,523 | 3,351,058 | 36,601,154 |
| 80,226 | 95,091 | 174,181 | 117,107 | 76,472 | 75,120 | 7,467,490 | 11,311,079 |
| 24,166 | 25,596 | 27,503 | 18,857 | 56,26 | 47,848 | 1,849 281 | 3,144 706 |
| 182,415 | 284,736 | 23,311 | 2[illegible],958 | 209,453 | 274,314 | 2,880,058 | 5,480,789 |
| 690,019 | 631,707 | 560 435 | 512,618 | 2,168,617 | 2,036,116 | 25,728,416 | 38,372,734 |
| 541,209 | 881 877 | 894,043 | 775,230 | 1,915,907 | 2,279 722 | 24,209,258 | 73 434,621 |
| 389,891 | 582,990 | 1,122,493 | 2,157,375 | 2,263,776 | 2,498,528 | 22,478,555 | 50,116,964 |
| 69,025 | 291,145 | 149,960 | 258,228 | 323,247 | 921,161 | 3,689,275 | 21,7[illegible]6,786 |
| .... . | 41,000 | ..... .. | 15,702 | ... ... | 128,309 | ........ | 3,205,522 |
| 442,763 | 457,845 | 1,102, 91 | 938,990 | 2,891,163 | 2,330,595 | 29,661,436 | 61,868 237 |
| 414,798 | 329,855 | 110,333 | 180,855 | 597,301 | 642,855 | 11,152,275 | 24,751,822 |
| 125,890 | 149,827 | 451,577 | 452,472 | 54,598 | 54,783 | 9,705,726 | 15,437,533 |
| 98,595 | 119,254 | 177 902 | 155,765 | 352,911 | 387,756 | 7,997,634 | 14,667,853 |
| 83,284 | 97,201 | 188,651 | 114 829 | 81,119 | 73,948 | 9,647 710 | 12,737,744 |
| 119,471 | 267,683 | 746,435 | 1,465,477 | 205,847 | 374,664 | 8,008,734 | 23,220,026 |
| 740 | 51,04[illegible] | 80 | 13,123 | 734 | 101,252 | 92,859 | 3,655,366 |
| 436,254 | 415,559 | 304,929 | 337,754 | 1,582,734 | 1,534,097 | 19,403,662 | 40,245,079 |
| 449,173 | 657,153 | 762,511 | 937,445 | 1,702,625 | 2,354,425 | 19,887,580 | 53,693,673 |
| 114,6 6 | 118 075 | 384,756 | 310,534 | 63,487 | 51,935 | 8,871,001 | 10 924 627 |
| 80,455 | 89,909 | 160,488 | 135,228 | 250,370 | 236,089 | 10,679,291 | 16,134,693 |
| 767,406 | 727,837 | 3,453,241 | 2,617 855 | 1,018,252 | 919,178 | 73,570,499 | 103,856,296 |
| 434 402 | 416,676 | 595,249 | 546,749 | 1,812,813 | 1,883,214 | 17,717,647 | 31,130,803 |
| 749 067 | 9[illegible],781 | 3,942,929 | 3,063,887 | 1,964,770 | 2,175,623 | 44,121 741 | 80,433,780 |
| 24,188 | 93,001 | 15,382 | 75,936 | 30,235 | 79,660 | 1,876,189 | 6 2[illegible]2 892 |
| 562,195 | 685 575 | 1,822,357 | 1,631,540 | 1,040,366 | 1,031,266 | 41 500,053 | 69,672,726 |
| 9,375 | 11,548 | 44,296 | 32,624 | 19,509 | 17,478 | 1,532,637 | 2 042 044 |
| 563,935 | 320,209 | 285,551 | 233,509 | 1,065,503 | 965,779 | 15,060,015 | 23 934,465 |
| 414,051 | 408,574 | 811,591 | 773,317 | 3,104,800 | 2,343,948 | 29,978,016 | 61,257,374 |
| 661,018 | 2,733,267 | 100,530 | 783,618 | 692,022 | 1,368,378 | 10,412,927 | 52 892,934 |
| 154 143 | 149,359 | 1,014,122 | 721,993 | 66 296 | 49,433 | 12,643,228 | 15,884,393 |
| 669,137 | 615 696 | 1,310,004 | 1,042,946 | 1,829,843 | 1,589,519 | 33,656,659 | 47,794,256 |
| 76,293 | 225,210 | 124,896 | 332,454 | 159,276 | 333,957 | 4,897,385 | 17,807,366 |
| 10,280,372 | 14,599,325 | 21,342,537 | 22,431,428 | 30,344 350 | 32,497,811 | 542,067,276 | 1,098,862,355 |
| 123 | 198 | 150 | 40 | 1,635 | 1,099 | 71,643 | 109,640 |
| ...... | 338 | .......... | 22 | .......... | 287 | ..... | 39,116 |
| .... | 8,870 | ... ... | 1,757 | ........ | 25,965 | ........ | 1,216,328 |
| 10,085 | 29,228 | 377,271 | 836,459 | 7,314 | 9,489 | 1,494 629 | 4,386,084 |
| 2,489 | 17,369 | 3,262 | 37,888 | 914 | 10,780 | 546,968 | 1,729 012 |
| ...... | 16,072 | ... ..... | 10,162 | ..... | 9,836 | .......... | 1,147,681 |
| 12 697 | 72 075 | 380,683 | 886,328 | 9 863 | 57,456 | 2,113 240 | 8 627 861 |
| 10,293,069 | 14,671,400 | 21,723,220 | 23,317,756 | 30,354,213 | 32,555,267 | 544,180,516 | 1,107,490,216 |

| STATES | WHEAT. | | RYE. | | INDIAN CORN. | |
|---|---|---|---|---|---|---|
| | 1850. | 1860. | 1850. | 1860. | 1850. | 1860. |
| | Bushels | Bushels | Bushels. | Bushels. | Bushels. | Bushels. |
| Alabama.......... | 294,044 | 1,222,487 | 17,261 | 73,942 | 28,754,048 | 32,761,194 |
| Arkansas ......... | 199,639 | 955,298 | 8,047 | 77,869 | 8,893,939 | 17,758,665 |
| California......... | 17,228 | 5,946,619 | ......... | 51,244 | 12,236 | 524,857 |
| Connecticut ....... | 41,762 | 52 401 | 600,893 | 618,702 | 1,935,043 | 2,059,835 |
| Delaware ......... | 482,511 | 912,941 | 8,066 | 27,209 | 3,145,542 | 3,892,337 |
| Florida ...... .... | 1,027 | 2,808 | 1,152 | 21,314 | 1,996,809 | 2,824,538 |
| Georgia............ | 1,088,534 | 2 544,913 | 53,750 | 115,532 | 30,080,099 | 30,776,293 |
| Illinois ............ | 9,414 575 | 24,159 500 | 83,364 | 981,322 | 57,646,984 | 115,296,779 |
| Indiana............ | 6,214,458 | 15,219,120 | 78,792 | 400,226 | 52,964,363 | 69,641,591 |
| Iowa .............. | 1,530,581 | 8,433,205 | 19,916 | 176,055 | 8,656,799 | 41,116,994 |
| Kansas ...... .... | .......... | 168,527 | ..... ... | 3,928 | .......... | 5,678,834 |
| Kentucky ........ | 2,142,822 | 7,394,811 | 415,073 | 1,055,262 | 58,672,591 | 64,043,633 |
| Louisiana.......... | 417 | 29,283 | 475 | 12,789 | 10,266,373 | 16,205,856 |
| Maine ... ........ | 296,259 | 233,877 | 102,916 | 123,290 | 1,750,056 | 1,546,071 |
| Maryland.......... | 4,494,680 | 6,103,480 | 226,014 | 518,901 | 10,749,858 | 13,444,922 |
| Massachusetts .... | 31,211 | 119,783 | 481,021 | 388,085 | 2,345,490 | 2 157,063 |
| Michigan .......... | 4,925,889 | 8,313,185 | 105,871 | 494,197 | 5,641,420 | 12 152,110 |
| Minnesota.......... | 1,401 | 2,195,812 | 125 | 124,259 | 16,725 | 2,987,570 |
| Mississippi ....... | 137,990 | 579,452 | 9,606 | 41,260 | 22,446,552 | 29,563,735 |
| Missouri........... | 2,981,652 | 4,227,586 | 44,268 | 293,262 | 36,214,537 | 72,892,157 |
| New Hampshire ... | 185,658 | 238,966 | 183,117 | 128,248 | 1,573,670 | 1,414 628 |
| New Jersey ...... | 1,601,190 | 1,763,128 | 1 255,578 | 1,439,497 | 8,759,704 | 9,723,336 |
| New York ......... | 13,121,498 | 8,681,100 | 4,148,182 | 4,786,905 | 17,858,400 | 20,061,048 |
| North Carolina .... | 2,130,102 | 4,743,706 | 229,563 | 436,856 | 27,941,051 | 30,078,564 |
| Ohio .............. | 14 487,351 | 14,532,570 | 425,918 | 656,146 | 59,078,695 | 70,637,140 |
| Oregon ............ | 211,943 | 822,408 | 106 | 2,714 | 2,918 | 74,566 |
| Pennsylvania...... | 15,367,691 | 13,045,231 | 4,805,160 | 5,474,792 | 19,835,214 | 28,196,821 |
| Rhode Island...... | 49 | 1,131 | 26 409 | 28,259 | 539,201 | 458,912 |
| South Carolina .... | 1,066,277 | 1 285,631 | 43,790 | 89,091 | 16,271,454 | 15,065,606 |
| Tennessee.......... | 1,619,386 | 5,409,863 | 89,137 | 265,344 | 52,276,223 | 50,748,266 |
| Texas ............. | 41,729 | 1,464,273 | 3,108 | 95,012 | 6,028,876 | 16,521,593 |
| Vermont........... | 535,955 | 431,127 | 176,233 | 130,976 | 2,032,396 | 1,463,020 |
| Virginia........... | 11,212,616 | 13,129,180 | 458,930 | 944,024 | 35,254,319 | 38,360,704 |
| Wisconsin ........ | 4 286,131 | 15,812,625 | 81,253 | 888,534 | 1,988,979 | 7,565,290 |
| Total States..... | 100,164,356 | 170,176,027 | 14,183,094 | 20 965,046 | 591,630,564 | 827,694,528 |
| TERRITORIES. | | | | | | |
| Columbia, Dist. of . | 17,370 | 12,760 | 5,509 | 6,939 | 65,230 | 80,840 |
| Dakota ........... | .......... | 945 | ......... | 700 | ........... | 20,296 |
| Nebraska ......... | .... ..... | 72,268 | .......... | 1,185 | .......... | 1,846,785 |
| New Mexico....... | 196,516 | 446,075 | ........ | 1,300 | 365,411 | 710,605 |
| Utah ........... | 107,702 | 382,697 | 210 | 872 | 9,899 | 93,861 |
| Washington ....... | ......... | 92,609 | .......... | 244 | ........... | 4,792 |
| Total Territories . | 321 588 | 1,007,354 | 5,719 | 11,240 | 440,540 | 2,757,179 |
| Aggregate....... | 100,485,944 | 171,183,381 | 14 188,813 | 20,976,286 | 592,071,104 | 830,451,707 |

*for* 1850 *and* 1860—Continued.

| OATS. | | RICE. | | TOBACCO. | | GINNED COTTON. | |
|---|---|---|---|---|---|---|---|
| 1850. | 1860. | 1850. | 1860. | 1850. | 1860. | 1850. | 1860. |
| Bushels. | Bushels. | Pounds | Pounds. | Pounds. | Pounds. | Bales.* | Bales. |
| 2,965,696 | 716,435 | 2,312,252 | 499,559 | 164,990 | 221,284 | 564,429 | 997,978 |
| 656,183 | 502,866 | 63,179 | 215 | 218,936 | 999,757 | 65,344 | 367,485 |
| ........ | 957,684 | ........ | 1,800 | 1,000 | 3,159 | ........ | ........ |
| 1,258,738 | 1,522,218 | ........ | ........ | 1,267,624 | 6,000,133 | ........ | ........ |
| 604,518 | 1,046,910 | ........ | ........ | ........ | 9,699 | ........ | ........ |
| 66,586 | 46,779 | 1,075,090 | 223,209 | 998,614 | 758,015 | 45,131 | 63,322 |
| 3,820,044 | 1,231,817 | 38,950,691 | 52,507,652 | 423,924 | 919,316 | 499,091 | 701,840 |
| 10,087,241 | 15,336,072 | ........ | ........ | 841,394 | 7,014,230 | ........ | 6 |
| 5,655,014 | 5,028,755 | ........ | 1,219 | 1,044,620 | 7,246,132 | 14 | ........ |
| 1,521,345 | 5,879,653 | ........ | ........ | 6,041 | 312,919 | ........ | ........ |
| ........ | 80,744 | ........ | ........ | ........ | 16,978 | ........ | ........ |
| 8,201,311 | 4,617,029 | 5,688 | 24,407 | 55,501,196 | 108,102,433 | 758 | 4,092 |
| 89,637 | 65,845 | 4,425,349 | 6,455,017 | 26,878 | 40,610 | 178,737 | 722,218 |
| 2,181,037 | 2,988,939 | ........ | ........ | ........ | 1,583 | ........ | ........ |
| 2,242,151 | 3,959,298 | ........ | ........ | 21,407,497 | 38,410,965 | ........ | ........ |
| 1,165,146 | 1,180,075 | ........ | ........ | 138,246 | 3,233,198 | ........ | ........ |
| 2,866,056 | 4,073,098 | ........ | ........ | 1,245 | 120,621 | ........ | ........ |
| 30,582 | 2,202,050 | ........ | ........ | ........ | 38,510 | ........ | ........ |
| 1,503,288 | 121,033 | 2,719,856 | 657,293 | 49,960 | 127,736 | 484,292 | 1,195,699 |
| 5,278,079 | 3,680,870 | 700 | 9,767 | 17,113,784 | 25,086,196 | ........ | 100 |
| 973,381 | 1,329,213 | ........ | ........ | 50 | 21,281 | ........ | ........ |
| 3,378,063 | 4,539,132 | ........ | ........ | 310 | 149,485 | ........ | ........ |
| 26,552,814 | 35,175,133 | ........ | 1,120 | 83,189 | 5,764,582 | ........ | ........ |
| 4,052,078 | 2,781,860 | 5,465,868 | 7,593,976 | 11,984,786 | 32,853,250 | 50,545 | 145,514 |
| 13,472,742 | 15,479,133 | ........ | ........ | 10,454,449 | 25,528,972 | ........ | ........ |
| 61,214 | 900,204 | ........ | ........ | 325 | 215 | ........ | ........ |
| 21,538,156 | 27,387,149 | ........ | ........ | 912,651 | 3,181,586 | ........ | ........ |
| 215,232 | 234,453 | ........ | ........ | ........ | 705 | ........ | ........ |
| 2,322,155 | 936,974 | 159,930,613 | 119,100,528 | 74,285 | 104,412 | 300,901 | 353,413 |
| 7,703,086 | 2,343,122 | 258,854 | 30,516 | 20,148,932 | 38,931,277 | 194,432 | 227,450 |
| 199,017 | 988,812 | 88,203 | 25,670 | 66,897 | 98,016 | 58,072 | 405,100 |
| 2,507,734 | 3,511,605 | ........ | ........ | ........ | 12,153 | ........ | ........ |
| 10,179,144 | 10,184,865 | 17,154 | 5,225 | 56,803,227 | 123,967,757 | 3,947 | 12,727 |
| 3,414,672 | 11,059,270 | ........ | ........ | 1,268 | 87,595 | ........ | ........ |
| 146,565,140 | 172,089,095 | 215,313,497 | 187,140,173 | 199,736,318 | 429,364,751 | 2,445,793 | 5,196,944 |
| 8,134 | 29,548 | ........ | ........ | 7,800 | 15,200 | ........ | ........ |
| ........ | 2,540 | ........ | ........ | ........ | ........ | ........ | ........ |
| ........ | 79,977 | ........ | ........ | ........ | 3,801 | ........ | ........ |
| 5 | 7,491 | ........ | ........ | 8,467 | 6,999 | ........ | ........ |
| 10,900 | 188,036 | ........ | ........ | 70 | 10 | ........ | 1,133 |
| ........ | 158,001 | ........ | ........ | ........ | 10 | ........ | ........ |
| 19,039 | 465,593 | ........ | ........ | 16,337 | 26,020 | ........ | 1,133 |
| 146,584,179 | 172,554,688 | 215,313,497 | 187,140,173 | 199,752,655 | 429,390,771 | 2,445,793 | 5,198,077 |

* Of 400 pounds each.

| STATES. | WOOL. | | PEAS AND BEANS. | | IRISH POTATOES. | |
|---|---|---|---|---|---|---|
| | 1850. | 1860. | 1850. | 1860. | 1850. | 1860. |
| | Pounds. | Pounds | Bushels. | Bushels. | Bushels. | Bushels. |
| Alabama | 657,118 | 681,404 | 892,701 | 1,483,609 | 246,001 | 397,566 |
| Arkansas | 182,595 | 410,285 | 285,738 | 439,412 | 193,832 | 418,000 |
| California | 5 520 | 2,681,922 | 2,292 | 184 962 | 9,292 | 1,647,293 |
| Connecticut | 497,454 | 335,986 | 19,090 | 25,864 | 2,689,725 | 1,833,148 |
| Delaware | 57,768 | 50,201 | 4,120 | 7,438 | 240,542 | 377,931 |
| Florida | 23,247 | 58,594 | 135,359 | 364 738 | 7,828 | 18,549 |
| Georgia | 990 019 | 946,229 | 1,142,011 | 1,765,214 | 227,379 | 316,552 |
| Illinois | 2,150,113 | 2,477,563 | 82,814 | 112,624 | 2,514,861 | 5,799 964 |
| Indiana | 2,610,287 | 2,466,264 | 35,773 | 77,701 | 2,083,337 | 3,873,130 |
| Iowa | 373,898 | 653,036 | 4,775 | 45 570 | 276,120 | 2,700,515 |
| Kansas | ........ | 22,593 | ......... | 10,167 | ........ | 283,968 |
| Kentucky | 2,297,433 | 2,325,124 | 202,574 | 288,349 | 1,492,487 | 1,756,532 |
| Louisiana | 109,897 | 296,187 | 161,732 | 430,410 | 95,632 | 332,725 |
| Maine | 1 364,034 | 1 495,063 | 205,541 | 246,918 | 3,436 040 | 6,374,617 |
| Maryland | 477,438 | 491,511 | 12 816 | 34,407 | 764,939 | 1,264,429 |
| Massachusetts | 585,136 | 377,267 | 43,709 | 45 346 | 3,585,384 | 3 201,901 |
| Michigan | 2,043,283 | 4,062,858 | 74,254 | 182,195 | 2,359,897 | 5,264,733 |
| Minnesota | 85 | 22,740 | 10,002 | 18,802 | 21,145 | 2,027,945 |
| Mississippi | 559,619 | 637,729 | 1 072,757 | 1,986,558 | 261,482 | 401,804 |
| Missouri | 1,627,164 | 2,069 778 | 46,017 | 107,999 | 939,006 | 1,990,850 |
| New Hampshire | 1,108,476 | 1,160,212 | 70,856 | 79,455 | 4,304,919 | 4,137,543 |
| New Jersey | 375,396 | 349 250 | 14,174 | 27,675 | ,207,236 | 4,171,690 |
| New York | 10,071 301 | 9,454,473 | 741,546 | 1,609,334 | 15,398,368 | 26,447,389 |
| North Carolina | 970,738 | 883,473 | 1,584,252 | 1,932,201 | 620,318 | 830 565 |
| Ohio | 10,196,371 | 10,648,161 | 60,168 | 105,219 | 5,057,769 | 8,752 873 |
| Oregon | 29,686 | 208 94[illegible] | 6,566 | 34,616 | 91,326 | 311,700 |
| Pennsylvania | 4,481,570 | 4,752,523 | 55,231 | 123 094 | 5,980,732 | 11,687,468 |
| Rhode Island | 129,692 | 90,699 | 6,846 | 7,699 | 651,029 | 542,409 |
| South Carolina | 487,233 | 427,102 | 1,026,900 | 1,728 074 | 136,494 | 226,736 |
| Tennessee | 1,364,378 | 1,400 508 | 369,321 | 550,913 | 1,067 844 | 1,174,647 |
| Texas | 131,917 | 1,497,748 | 179,350 | 359 560 | 94,645 | 168,937 |
| Vermont | 3,400,717 | 2 975,544 | 104,649 | 68,912 | 4,951,014 | 5,147,908 |
| Virginia | 2,860,765 | 2 509,443 | 521,579 | 515,004 | 1,316,933 | 2,292,118 |
| Wisconsin | 253,963 | 1,011,915 | 20,657 | 99 804 | 1,402,077 | 3,848,505 |
| Total States | 52,474,311 | 59 932 328 | 9,196,170 | 15 099,746 | 65,725 633 | 110,023,139 |
| TERRITORIES. | | | | | | |
| Columbia, District of | 525 | 100 | 7,754 | 3,749 | 28,292 | 31,733 |
| Dakota | ......... | ..... | ......... | 286 | .......... | 9,489 |
| Nebraska | ..... | 3,312 | .......... | 4,508 | ......... | 169,762 |
| New Mexico | 32,901 | 479,245 | 15,688 | 38,584 | 3 | 5,354 |
| Utah | 9,222 | 75 638 | 289 | 3,135 | 43 968 | 140,370 |
| Washington | ....... | 20,720 | .......... | 38,005 | ......... | 191,354 |
| Total Territories | 42 648 | 579,015 | 23,731 | 88,267 | 72,263 | 548,062 |
| Aggregate | 52,516,959 | 60,511,343 | 9,219,901 | 15,188,013 | 65,797,896 | 110,571,201 |

*for* 1850 *and* 1860—Continued.

| SWEET POTATOES. | | BARLEY. | | BUCKWHEAT. | | VALUE OF ORCHARD PRODUCTS. | |
|---|---|---|---|---|---|---|---|
| 1850. | 1860. | 1850. | 1860. | 1850. | 1860. | 1850. | 1860. |
| Bushels. | Bushels | Bushels. | Bushels. | Bushels | Bushels. | Dollars. | Dollars. |
| 5,475,204 | 5,420,987 | 3,958 | 14,703 | 348 | 1,334 | 15,408 | 213,328 |
| 788,149 | 1,462,714 | 177 | 3,079 | 175 | 488 | 40,141 | 56,230 |
| 1,000 | 158,001 | 9,712 | 4,307,775 | ........ | 36,486 | 17,700 | 607,459 |
| 80 | 2,710 | 19,099 | 20,813 | 229,297 | 309,107 | 175,118 | 508,848 |
| 65,443 | 142,213 | 56 | 3,646 | 8,615 | 16,355 | 46,574 | 114,225 |
| 757,226 | 1,213,493 | ........ | 15 | 55 | ........ | 1,280 | 21,716 |
| 6,986,428 | 6,508,541 | 11,501 | 14,682 | 250 | 2,023 | 92,776 | 176,048 |
| 157,433 | 341,443 | 110,795 | 1,175,651 | 184,504 | 345,069 | 446,049 | 1,145,936 |
| 201,711 | 284,304 | 45,483 | 296,374 | 149,740 | 367,797 | 324,940 | 1,212,142 |
| 6,243 | 50,938 | 25,093 | 454,116 | 52,516 | 216,524 | 8,434 | 131,234 |
| ........ | 9,221 | ........ | 4,128 | ........ | 36,799 | ........ | 724 |
| 998,179 | 1,057,558 | 95,343 | 270,685 | 16,097 | 18,929 | 106,230 | 604,851 |
| 1,428,453 | 2,070,901 | ........ | 144 | 3 | 16 | 22,359 | 110,923 |
| ..... | 1,435 | 151,731 | 802,109 | 104,523 | 339,520 | 342,865 | 501,767 |
| 208,993 | 23,744 | 745 | 17,350 | 103,671 | 212,338 | 164,051 | 252,196 |
| ..... | 616 | 112,385 | 134,891 | 105,895 | 123,202 | 463,995 | 925,519 |
| 1,177 | 36,245 | 75,249 | 305,914 | 472,917 | 600,435 | 132,650 | 1,137,678 |
| 200 | 781 | 1,216 | 125,130 | 515 | 27,677 | ........ | 298 |
| 4,741,795 | 4,348,491 | 228 | 1,596 | 1,121 | 1,740 | 50,405 | 259,380 |
| 335,505 | 335,102 | 9,631 | 228,502 | 23,641 | 182,292 | 514,711 | 810,975 |
| ........ | 161 | 70,256 | 121,103 | 65,265 | 89,996 | 248,563 | 557,934 |
| 508,015 | 1,034,832 | 6,492 | 24,915 | 878,934 | 877,386 | 607,268 | 4 9,402 |
| 5,629 | 7,523 | 3,585,059 | 4,186,667 | 3,183,955 | 5,126,305 | 1,761,950 | 3,726,380 |
| 5,095,709 | 6,140,039 | 2,725 | 3,445 | 16,704 | 35,924 | 34,348 | 643,688 |
| 187,991 | 297,908 | 354,358 | 1,601,082 | 638,060 | 2,327,005 | 695,921 | 1,858,678 |
| ........ | 335 | ........ | 26,463 | ........ | 2,685 | 1,271 | 474,934 |
| 52,172 | 103,190 | 165,584 | 530,716 | 2,193,692 | 5,572,026 | 723,389 | 1,479,938 |
| ... | 946 | 18,875 | 40,993 | 1,245 | 3,573 | 63,994 | 83,691 |
| 4,337,469 | 4,115,698 | 4,583 | 11,490 | 283 | 602 | 35,108 | 213,989 |
| 2,777,716 | 2,614,558 | 2,737 | 23,489 | 19,427 | 14,421 | 52,894 | 314,269 |
| 1,332,158 | 1,853,306 | 4,776 | 38,905 | 59 | 1,612 | 12,505 | 46,802 |
| ........ | 623 | 42,150 | 75,282 | 209,819 | 215,821 | 315,255 | 198,427 |
| 1,813,634 | 1,960,808 | 25,437 | 68,759 | 214,898 | 477,808 | 177,137 | 800,650 |
| 879 | 2,345 | 209,692 | 678,992 | 79,878 | 67,622 | 4,823 | 76,096 |
| 38,264,591 | 41,601,750 | 5,165,136 | 15,613,604 | 8,956,102 | 17,651,061 | 7,700,112 | 19,696,345 |
| 3,497 | 4,191 | 75 | 175 | 378 | 445 | 14,843 | 9,980 |
| ........ | ........ | ........ | ........ | ........ | ........ | ........ | 115 |
| ........ | 163 | ........ | 1,243 | ........ | 12,329 | ........ | 161 |
| ........ | 180 | 5 | 6,099 | 100 | 6 | 8,231 | 19,701 |
| 60 | ........ | 1,799 | 12,283 | 332 | 96 | ........ | 9,280 |
| ........ | 18 | ........ | 1,715 | ........ | 977 | ........ | 23,779 |
| 3,557 | 4,552 | 1,879 | 21,515 | 810 | 13,853 | 23,074 | 63,016 |
| 38,268,148 | 41,606,302 | 5,167,015 | 15,635,119 | 8,956,912 | 17,664,914 | 7,723,186 | 19,759,361 |

| STATES. | WINE. | | VALUE OF PRODUCTIONS OF MARKET GARDENS. | | BUTTER. | |
|---|---|---|---|---|---|---|
| | 1850. | 1860. | 1850. | 1860. | 1850. | 1860. |
| | Gallons. | Gallons. | Dollars. | Dollars. | Pounds. | Pounds. |
| Alabama | 220 | 19,130 | 84,821 | 135,181 | 4,008,811 | 6,125,708 |
| Arkansas | 35 | 1,005 | 17,150 | 38,094 | 1,854,239 | 4,062,481 |
| California | 58,055 | 494,516 | 75,275 | 1,074,143 | 705 | 3,338,590 |
| Connecticut | 4,269 | 46,783 | 196,874 | 337,025 | 6,498,119 | 7,620,912 |
| Delaware | 145 | 683 | 12,714 | 37,797 | 1,055,308 | 1,430,502 |
| Florida | 10 | 1,661 | 8,721 | 18,213 | 371,498 | 404,470 |
| Georgia | 796 | 27,646 | 76,500 | 201,916 | 4,640,559 | 5,439,765 |
| Illinois | 2,997 | 47,093 | 127,494 | 418,195 | 12,526,543 | 28,337,516 |
| Indiana | 14,055 | 88,275 | 72,864 | 288,070 | 12,881,535 | 17,934,767 |
| Iowa | 420 | 3,706 | 8,848 | 141,549 | 2,171,188 | 11,526,002 |
| Kansas | .......... | 241 | .......... | 36,353 | .......... | 1,012,975 |
| Kentucky | 8,093 | 179,949 | 303,120 | 458,246 | 9,947,523 | 11,716,609 |
| Louisiana | 15 | 5,030 | 148,329 | 390,742 | 683,069 | 1,440,943 |
| Maine | 724 | 3,165 | 122,387 | 194,006 | 9,243,811 | 11,687,781 |
| Maryland | 1,431 | 3,222 | 200,869 | 530,221 | 3,806,160 | 5,265,295 |
| Massachusetts | 4,688 | 20,915 | 600,020 | 1,397,623 | 8,071,370 | 8,297,936 |
| Michigan | 1,654 | 13,733 | 14,738 | 145,058 | 7,065,878 | 14,650,384 |
| Minnesota | .......... | 394 | 150 | 94,681 | 1,100 | 2,961,591 |
| Mississippi | 407 | 10,106 | 46,250 | 124,608 | 4,346,234 | 5,111,185 |
| Missouri | 10,563 | 27,827 | 99 454 | 346,405 | 7,834,359 | 12,704,837 |
| New Hampshire | 344 | 9,401 | 56,810 | 76,256 | 6,977,056 | 6,956,764 |
| New Jersey | 1,811 | 21,083 | 475,242 | 1,542,155 | 9,487,210 | 10,714,447 |
| New York | 9,172 | 61,404 | 912,047 | 3,381,596 | 79,766,094 | 103,097,279 |
| North Carolina | 11,058 | 54,064 | 39,462 | 75,663 | 4,146,290 | 4,735,495 |
| Ohio | 48,207 | 562,640 | 214 004 | 860,313 | 34,449,379 | 50,495,745 |
| Oregon | ........ | 2,603 | 90,241 | 86,335 | 211,464 | 1,012,339 |
| Pennsylvania | 25,590 | 38,623 | 688,714 | 1,384,970 | 39,878,418 | 58,653,511 |
| Rhode Island | 1,013 | 507 | 98,298 | 146,661 | 995,670 | 1,014,856 |
| South Carolina | 5,880 | 24,964 | 47,286 | 187,348 | 2,981,850 | 3,177,934 |
| Tennessee | 92 | 13,562 | 97,183 | 274,163 | 8,139,585 | 10,000,823 |
| Texas | 99 | 13,946 | 12,354 | 55,943 | 2,344,900 | 5,948,611 |
| Vermont | 659 | 2,923 | 18,853 | 24,792 | 12,137,980 | 15,681,834 |
| Virginia | 5,408 | 40,508 | 183,047 | 589,411 | 11,089,359 | 13,461,712 |
| Wisconsin | 113 | 9,511 | 32,142 | 207,153 | 3,633,750 | 13,651,053 |
| Total States | 218,023 | 1,850,819 | 5,182,261 | 15,300,885 | 313,247,014 | 459,672,652 |
| TERRITORIES. | | | | | | |
| Columbia, District of | 863 | 118 | 67,222 | 139,108 | 14,872 | 18,835 |
| Dakota | .......... | .......... | .......... | 500 | .......... | 1,670 |
| Nebraska | .......... | 631 | .......... | 9,680 | .......... | 352,697 |
| New Mexico | 2,363 | 8,201 | 6,679 | 17,640 | 111 | 13,133 |
| Utah | .......... | 60 | 23,868 | 45,465 | 83,309 | 293,065 |
| Washington | .......... | 179 | .......... | 27,749 | .......... | 157 802 |
| Total Territories | 3,226 | 9,189 | 97,769 | 240,142 | 98,292 | 837,202 |
| Aggregate | 221,249 | 1,860,008 | 5,280,030 | 15,541,027 | 313,345,306 | 460,509,854 |

*for* **1850** *and* **1860—Continued.**

| CHEESE. | | HAY. | | CLOVER SEED. | | GRASS SEED. | |
|---|---|---|---|---|---|---|---|
| 1850. | 1860. | 1850. | 1860. | 1850. | 1860. | 1850. | 1860. |
| Pounds. | Pounds. | Tons. | Tons. | Bushels. | Bushels. | Bushels. | Bushels. |
| 31,412 | 9,607 | 32,685 | 55,219 | 138 | 187 | 547 | 653 |
| 30,088 | 16,952 | 3,976 | 8,276 | 90 | 60 | 436 | 3,110 |
| 150 | 1,564,857 | 2,038 | 306,741 | .......... | 4 | .......... | 162 |
| 5,363,277 | 3,898,411 | 516,131 | 562,425 | 13,841 | 13,671 | 16,628 | 13,024 |
| 3,187 | 6,579 | 30,159 | 36,973 | 2,525 | 3,595 | 1,403 | 1,165 |
| 18 015 | 3,784 | 2,510 | 7,594 | .......... | .......... | 2 | .......... |
| 46,976 | 15,587 | 23,449 | 46,448 | 132 | 635 | 428 | 1,914 |
| 1,278,225 | 1,695,358 | 601,952 | 1,834,265 | 3,427 | 16,687 | 14,380 | 202,808 |
| 624,564 | 569,574 | 403,230 | 635,322 | 18,320 | 45,321 | 11,951 | 31,866 |
| 209 840 | 901,220 | 89,055 | 707,260 | 342 | 1,564 | 2,096 | 69,432 |
| .......... | 28,053 | .......... | 50,812 | .......... | 98 | .......... | 2,633 |
| 213,954 | 190,400 | 113,747 | 158,484 | 3,230 | 2,308 | 21,481 | 62,563 |
| 1,957 | 5,494 | 25,752 | 46,999 | 2 | .......... | 97 | 701 |
| 2,434,454 | 1,799,862 | 755,889 | 975,716 | 9,097 | 48,851 | 9,214 | 6,307 |
| 3,975 | 8,342 | 157,956 | 191,744 | 15,217 | 39,811 | 2,561 | 3,195 |
| 7,088,142 | 5,294,090 | 651,807 | 665,331 | 1,002 | 1,295 | 5,085 | 4,852 |
| 1,011,492 | 2,009,064 | 404,934 | 756,908 | 16,989 | 49,480 | 9,285 | 6,555 |
| .......... | 198,904 | 2,019 | 274,952 | .......... | 156 | .......... | 2,314 |
| 21,191 | 3,419 | 12,504 | 32,885 | 84 | 217 | 533 | 1,175 |
| 203,572 | 259,633 | 116,925 | 401 070 | 619 | 2,216 | 4,346 | 55,713 |
| 3,196,563 | 2,232,092 | 598,854 | 642,741 | 829 | 11,992 | 8,071 | 5,573 |
| 365,756 | 182,172 | 435,950 | 508,729 | 28,280 | 39,208 | 63,051 | 85,410 |
| 49,741,413 | 48,548,288 | 3,728,797 | 3,564,786 | 88,222 | 106,933 | 96,493 | 81,622 |
| 95,921 | 51,119 | 145,653 | 181,365 | 576 | 332 | 1,275 | 3,008 |
| 20,819,542 | 23,758,738 | 1,443,142 | 1,602,513 | 103,197 | 216,545 | 37,310 | 53,475 |
| 36,980 | 82,456 | 373 | 26,441 | 4 | 307 | 22 | 3,793 |
| 2,505,034 | 2,508,556 | 1,842,970 | 2,245,420 | 125,030 | 274,363 | 53,913 | 57,204 |
| 316,508 | 177,252 | 74,418 | 82,725 | 1,328 | 1,221 | 3,708 | 4,229 |
| 4,970 | 1,543 | 20,925 | 87,592 | 376 | 28 | 30 | 38 |
| 177,681 | 126,794 | 74,091 | 146,027 | 5,096 | 8,062 | 9,118 | 41,532 |
| 95,299 | 277,512 | 8,354 | 11,349 | 10 | 449 | .......... | 2,976 |
| 8,720,834 | 8,077,689 | 866,153 | 919,066 | 760 | 2,444 | 14,936 | 11,420 |
| 436,292 | 280,792 | 369,098 | 445,529 | 29,727 | 36,961 | 23,428 | 53,063 |
| 400,283 | 1,104,459 | 275,662 | 853,799 | 483 | 3,848 | 5,003 | 26,383 |
| 105,497,547 | 105,788,652 | 13,831,558 | 19,073,506 | 468,973 | 928,849 | 416,831 | 899,868 |
| 1,500 | .......... | 2,279 | 3,180 | 3 | .......... | .......... | .......... |
| .......... | .......... | .......... | 1,122 | .......... | 35 | .......... | .......... |
| .......... | 15,762 | .......... | 25,320 | .......... | 5 | .......... | 206 |
| 5,848 | 37,250 | .......... | 1,103 | .......... | 2 | .......... | .......... |
| 30,998 | 21,325 | 4,805 | 20,026 | 2 | 3 | .......... | 101 |
| .......... | 12,146 | .......... | 4,871 | .......... | 116 | .......... | 211 |
| 38,346 | 86,483 | 7,084 | 55,622 | 5 | 161 | .......... | 518 |
| 105,535,893 | 105,875,135 | 13,838,642 | 19,129,128 | 468,978 | 929,010 | 416,831 | 900,386 |

| STATES. | HEMP. | | | | | | HOPS. | |
|---|---|---|---|---|---|---|---|---|
| | Dew-rotted. | | Water rotted. | | Other prepared. | | | |
| | 1850. | 1860. | 1850. | 1860. | 1850 | 1860 | 1850. | 1860. |
| | Tons. | Tons. | Tons. | Tons. | Tons. | Tons. | Pounds. | Pounds. |
| Alabama | ...... | ..... | ..... | .. .. | ...... | ..... | 276 | 1,069 |
| Arkansas | ...... | 140 | 15 | 30 | ...... | 676 | 157 | 164 |
| California | ...... | ...... | ...... | ...... | ..... | ....... | ...... | 10 |
| Connecticut | ...... | 3 | ...... | ..... | ...... | ....... | 554 | 959 |
| Delaware | ...... | ...... | ...... | ...... | ...... | ...... | 348 | 414 |
| Florida | ...... | ...... | ...... | ...... | ...... | 1 | 14 | ......... |
| Georgia | ...... | 1 | ...... | ...... | ...... | 30 | 261 | 199 |
| Illinois | ...... | ...... | ...... | .... | ...... | ....... | 3,551 | 7,129 |
| Indiana | ...... | .... | ...... | ...... | .... | 1 | 92,796 | 75,053 |
| Iowa | ...... | ...... | ...... | ...... | ...... | ...... | 8,242 | 1,797 |
| Kansas | ...... | 44 | ...... | ...... | ...... | ...... | ....... | 130 |
| Kentucky | 16,432 | 33,044 | 1,355 | 2,026 | ..... | 4,344 | 4,309 | 5,899 |
| Louisiana | ...... | ...... | ...... | ...... | ...... | ...... | 125 | 8 |
| Main | ...... | ...... | ...... | ..... | ..... | 50 | 40,120 | 102,987 |
| Maryland | 63 | 18 | ...... | ...... | ...... | 254 | 1,870 | 2,943 |
| Massachusetts | ...... | ...... | .. .. | ...... | ...... | ...... | 121,595 | 111,301 |
| Michigan | ...... | ...... | ...... | ...... | ...... | ...... | 10,663 | 61,704 |
| Minnesota | ...... | ...... | ..... | ...... | ..... | ...... | ....... | 149 |
| Mississippi | 7 | 6 | ...... | ...... | ...... | ...... | 473 | 221 |
| Missouri | 15,968 | 15,789 | 60 | 1,507 | ..... | 1,972 | 4,130 | 2,265 |
| New Hampshire | ...... | 18 | ...... | 50 | ..... | 13 | 257,174 | 130,428 |
| New Jersey | ..... . | 230 | ...... | ...... | ...... | 200 | 2,133 | 3,722 |
| New York | 1 | 32,191 | 3 | 99 | ...... | 3,531 | 2,536,299 | 9,655,542 |
| North Carolina | 36 | ...... | 3 | ...... | ...... | 3,016 | 9,246 | 1,767 |
| Ohio | 100 | ...... | 50 | ...... | ..... | 3 | 63,731 | 22,344 |
| Oregon | ...... | 5 | ..... | ..... | ..... | ...... | 8 | 187 |
| Pennsylvania | 44 | 1,640 | ...... | 189 | ..... | 2,174 | 22.088 | 41,576 |
| Rhode Island | ...... | ...... | ...... | ...... | ...... | ...... | 277 | 50 |
| South Carolina | ..... | 1 | ..... | ..... | ...... | ...... | 26 | 122 |
| Tennessee | 454 | 6 | 141 | 10 | ..... | 787 | 1,0 2 | 2,329 |
| Texas | ...... | ...... | ...... | 10 | ...... | ...... | 7 | 122 |
| Vermont | ...... | 2 | ...... | 1 | ..... | ...... | 288,023 | 631,641 |
| Virginia | 88 | 5 | 51 | 3 | ...... | 4 | 11,506 | 10,015 |
| Wisconsin | ...... | 97 | ...... | 15 | ...... | 244 | 15,930 | 135,587 |
| Total States | 33,193 | 83,240 | 1,67- | 3 940 | ..... | 17,300 | 3 496,964 | 11,009,833 |
| TERRITORIES. | | | | | | | | |
| Columbia, District of | ...... | ...... | .... | ..... | ..... | ...... | 15 | 15 |
| Dakota | ...... | ...... | ... | ..... | ...... | ...... | ....... | ........ |
| Nebraska | ...... | 7 | ...... | 2 | ..... | ...... | ....... | 41 |
| New Mexico | ...... | ...... | .... | .... | ..... | ... .. | ..... | ........ |
| Utah | ...... | ...... | ..... | 1 | ..... | ...... | 50 | 95 |
| Washington | ... ... | ...... | ..... | .... | .... | ...... | ..... | 28 |
| Total Territories | ...... | 7 | .... | 3 | .... | . | 65 | 179 |
| Aggregate | 33,193 | 83,247 | 1,678 | 3,943 | ..... | 17,300 | 3,497,029 | 11,010,012 |

*for* **1850** *and* **1860—Continued.**

| FLAX. | | FLAXSEED. | | SILK COCOONS. | | MAPLE SUGAR. | |
|---|---|---|---|---|---|---|---|
| 1850. | 1860. | 1850. | 1860. | 1850. | 1860. | 1850 | 1860. |
| Pounds | Pounds | Bushels | Bushels | Pounds. | Pounds | Pounds. | Pounds. |
| 3 921 | 109 | 69 | 68 | 167 | ........ | 643 | 543 |
| 12,291 | 3,233 | 321 | 541 | 38 | 1 | 9,330 | 3,097 |
| ..... | ....... | ....... | ...... | ........ | ......... | | .......... |
| 17,928 | 1 187 | 703 | 109 | 328 | 18 | 50,796 | 44,259 |
| 11,174 | 8,112 | 904 | 2,126 | ....... | 9 | .... | .......... |
| 50 | .... | .......... | .... . | 6 | ......... | .... .. | ....... |
| 5 387 | 3 303 | 622 | 96 | 813 | 72 | 50 | 991 |
| 160,063 | 32,636 | 10,787 | 11,202 | 47 | 436 | 248,904 | 131,751 |
| 584,469 | 73,112 | 36 888 | 155 159 | 387 | 954 | 2,921,192 | 1,515,594 |
| 62,660 | 28,888 | 1,959 | 6,130 | 246 | 217 | 78 407 | 248,951 |
| ...... .. | 13 | .......... | 9 | ....... | .. .... | | 1,548 |
| 2,100,116 | 728 214 | 75,801 | 28,881 | 1,281 | 340 | 437,405 | 380,941 |
| ...... | ... | ....... | ...... | 29 | ......... | 255 | ... |
| 17,081 | 2 947 | 580 | 489 | 252 | 73 | 93 542 | 306,742 |
| 35,686 | 14,481 | 2,446 | 1,570 | 39 | 3 | 47 740 | 63 281 |
| 1 162 | 165 | 72 | 7 | 7 | ........ | 795,525 | 1,006,078 |
| 7,152 | [illegible] | 519 | 223 | 108 | 1,043 | 2,439 794 | 2,988,018 |
| ....... | 1 968 | ........ | 73 | .... .. | ........ | 2 950 | 370,947 |
| 665 | .... | 26 | 10 | 2 | ......... | .... | 99 |
| 627,160 | 109,837 | 13,696 | 4,656 | 186 | 127 | 178,910 | 142 430 |
| 7,652 | 1,347 | 189 | 31 | 191 | 1 | 1,298 863 | 2,255,012 |
| 182 965 | 48 651 | 16,525 | 3,241 | 23 | ....... | 2,197 | 3,455 |
| 940,577 | 1,514 476 | 57,963 | 56,986 | 1,774 | 259 | 10,357 487 | 10,816,458 |
| 593 796 | 216 490 | 38,196 | 20,008 | 229 | 338 | 27,932 | 30,845 |
| 446 932 | ..... | 188,880 | 250,768 | 1,552 | 2,166 | 4 588,209 | 3,323,942 |
| 640 | 50 | ... ... | 4 | ...... | ....... | . | .. ... |
| 530,307 | 310,030 | 41,728 | 24,209 | 285 | 163 | 2,326 525 | 2,768,965 |
| 85 | ..... | ......... | ..... | ...... | ........ | 28 | .. .... |
| 333 | 344 | 55 | 313 | 123 | 20 | 20 | 205 |
| 368,131 | 161,740 | 18,904 | 9,611 | 1,923 | 50 | 158,557 | 117,359 |
| 1 048 | ... | 26 | .... | 22 | 26 | . . | 69 |
| 20 852 | 5 187 | 9[illegible]9 | 331 | 268 | . ...... | 6,349,357 | 9,819,939 |
| 1,000,450 | 487,380 | 52,318 | 30 673 | 517 | 225 | 1,227,665 | 937,643 |
| 68,393 | 21 644 | 1,191 | 4,258 | .. .. .. | 15 | 610 976 | 1,584,406 |
| 7,709 126 | 3,778 843 | 562,307 | 611,780 | 10,843 | 6,561 | 34,253,436 | 38 863,568 |
| ......... | ...... | ......... | ........ | ......... | ...... | ........ | .......... |
| ......... | ......... | ......... | .... .... | ......... | ........ | ...... . | ......... |
| ......... | ...... | .. ...... | 2 | ......... | ....... | ...... . | 316 |
| ...... . | ....... | ......... | ...... | ........ | ......... | ........ | ......... |
| 550 | 4 197 | 5 | 145 | ......... | 1 | ......... | .......... |
| ...... | 39 | ......... | ..... | ......... | ...... . | ....... | .......... |
| 550 | 4 236 | 5 | 147 | ... | 1 | ...... | 316 |
| 7,709,676 | 3,783,079 | 562,312 | 611,927 | 10,843 | 6,562 | 34,253,436 | 38,863,884 |

| STATES. | CANE SUGAR. | | CANE MOLASSES. | | SORGHUM MOLASSES. | MAPLE MOLASSES. |
|---|---|---|---|---|---|---|
| | 1850. | 1860 | 1850. | 1860. | 1860. | 1860. |
| | Hhds * | Hhds.* | Gallons. | Gallons. | Gallons. | Gallons. |
| Alabama | 87 | 108 | 83,428 | 81,694 | 67,172 | ......... |
| Arkansas | ....... | ....... | 18 | ......... | ......... | 115,673 |
| California | ....... | ....... | ......... | ......... | 100 | ......... |
| Connecticut | ....... | ....... | 665 | ......... | 395 | 2,277 |
| Delaware | ....... | ....... | 50 | 761 | 852 | ......... |
| Florida | 2,750 | 1,761 | 352,893 | 435,890 | ......... | ......... |
| Georgia | 846 | 1,167 | 216,245 | 546,770 | 103,450 | 20 |
| Illinois | ....... | ....... | 8,354 | ......... | 797,096 | 21,423 |
| Indiana | ....... | ....... | 180,325 | ......... | 827,777 | 203,0[illegible]8 |
| Iowa | ....... | ....... | 3,162 | ......... | 1,993,474 | 97,751 |
| Kansas | ....... | ....... | ......... | ......... | 79,482 | 2 |
| Kentucky | 10 | ....... | 30,079 | ......... | 365,861 | 139,036 |
| Louisiana | 226,001 | 297,816 | 10,931,177 | 14,535,157 | ......... | 66,470 |
| Maine | ....... | ....... | 3,167 | ......... | ......... | ......... |
| Maryland | ....... | ....... | 1,430 | 45 | 862 | 2,404 |
| Massachusetts | ....... | ....... | 4,693 | ......... | ......... | ......... |
| Michigan | ....... | ....... | 19,823 | ......... | 266,509 | 364,521 |
| Minnesota | ....... | ....... | ......... | ......... | 14,974 | 21,829 |
| Mississippi | 8 | 244 | 18,318 | 3,445 | 8,207 | ......... |
| Missouri | ....... | ....... | 5,636 | 22,305 | 776,101 | 18,289 |
| New Hampshire | ....... | ....... | 9,811 | ......... | ......... | ......... |
| New Jersey | ....... | ....... | 954 | 36 | 360 | 8,088 |
| New York | ....... | ....... | 56,539 | 15 | 265 | 131,841 |
| North Carolina | ....... | 38 | 704 | 12,494 | 263,475 | 17,759 |
| Ohio | ....... | ....... | 197,308 | ......... | 707,416 | 392,932 |
| Oregon | ....... | ....... | 24 | ......... | 419 | ......... |
| Pennsylvania | ....... | ....... | 50,652 | ......... | 9,605 | 127,455 |
| Rhode Island | ....... | ....... | 4 | 15 | ......... | 5 |
| South Carolina | 77 | 198 | 15,904 | 15,144 | 51,041 | ......... |
| Tennessee | 3 | ....... | 7,223 | 294,322 | 485,828 | 6,754 |
| Texas | 7,351 | 590 | 441,918 | 388,937 | 115,051 | 3,600 |
| Vermont | ....... | ....... | 5,997 | ......... | ......... | ......... |
| Virginia | ....... | ....... | 40,322 | 50 | 221,017 | 100,139 |
| Wisconsin | ....... | 283 | 9,874 | ......... | 19,253 | 83,003 |
| Total States | 237,133 | 302,205 | 12,696,697 | 16,337,080 | 7,176,042 | 1,944,299 |
| TERRITORIES. | | | | | | |
| Columbia, District of | ....... | ....... | ......... | ......... | ......... | ......... |
| Dakota | ....... | ....... | ......... | ......... | ......... | 20 |
| Nebraska | ....... | ....... | ......... | ......... | 23,105 | 275 |
| New Mexico | ....... | ....... | 4,236 | ......... | 3,369 | ......... |
| Utah | ....... | ....... | 58 | ......... | 32,509 | ......... |
| Washington | ....... | ....... | ......... | ......... | ......... | ......... |
| Total Territories | ....... | ....... | 4,294 | ......... | 58,983 | 295 |
| Aggregate | 237,133 | 302,205 | 12,700,991 | 16,337,080 | 7,235,025 | 1,944,594 |

* Of 1,000 pounds each.

*for* 1850 *and* 1860—Continued.

| BEESWAX AND HONEY. | BEESWAX. | HONEY. | TOTAL BEESWAX AND HONEY. | VALUE OF HOME-MADE MANUFACTURES. | | VALUE OF ANIMALS SLAUGHTERED. | |
|---|---|---|---|---|---|---|---|
| 1850. | 1860. | 1860. | 1860. | 1850. | 1860. | 1850. | 1860. |
| Pounds. | Pounds. | Pounds. | Pounds. | Dollars. | Dollars. | Dollars. | Dollars. |
| 897,021 | 153,018 | 1,189,073 | 1,342,091 | 1,934,120 | 1,920,175 | 4,823,485 | 10,325,022 |
| 192,338 | 50,797 | 802 748 | 853,545 | 636,217 | 928,481 | 1,163,313 | 3,895,399 |
| ......... | 570 | 2,370 | 2,940 | 7,000 | 265,674 | 107,173 | 3,562 887 |
| 93,304 | 4.371 | 62,730 | 67,101 | 192,252 | 48,954 | 2,202,266 | 3,181,992 |
| 41,248 | 1,993 | 66,137 | 68,130 | 38,121 | 17,591 | 373,665 | 573,075 |
| 18,971 | 10,883 | 1,163,540 | 1,174,423 | 75,582 | 62,243 | 514,685 | 1,201,441 |
| 732,514 | 61,505 | 953,915 | 1,015,420 | 1,838,968 | 1,431 413 | 6,339,762 | 10,908,204 |
| 869,444 | 56,874 | 1,333,280 | 1,390,154 | 1,155,902 | 933,815 | 4,972,286 | 15,159,343 |
| 935,329 | 35,074 | 1,186,865 | 1,221,939 | 1,631,039 | 847,251 | 6,567,935 | 9,592,322 |
| 321,711 | 32,802 | 919,750 | 952,552 | 221,292 | 314,016 | 821,164 | 4,403,463 |
| ........... | 467 | 14,942 | 15,409 | ......... | 15,371 | ............ | 547,450 |
| 1,158,019 | 68 340 | 1,768,692 | 1,837,032 | 2,459,128 | 2,095,578 | 6,462,598 | 11,640,740 |
| 96,701 | 4,748 | 90,770 | 95,518 | 139,232 | 503,124 | 1,458,990 | 2,083,736 |
| 189,618 | 8,769 | 314,685 | 323,454 | 513,599 | 490,787 | 1,646,773 | 2,780,179 |
| 74,802 | 6,960 | 193,354 | 200,314 | 111,828 | 67,003 | 1,954,800 | 2,821,510 |
| 59,508 | 3,289 | 59,125 | 62,414 | 205,333 | 245,886 | 2,500,924 | 2,915,045 |
| 359,232 | 41,972 | 728,900 | 770,872 | 340,947 | 143,181 | 1,328,327 | 4,080,720 |
| 80 | 2,083 | 32,840 | 34,923 | ........ | 8,057 | 2,840 | 732,418 |
| 397,460 | 40,449 | 595,859 | 636,308 | 1,164,020 | 1,318,426 | 3,636,582 | 7,528,007 |
| 1,328.972 | 79,190 | 1,585,983 | 1,665,173 | 1,674,705 | 1,984,262 | 3,367,106 | 9,844,449 |
| 117,140 | 4 936 | 125,142 | 130,078 | 393,455 | 251,013 | 1,522,873 | 3,787,500 |
| 156,694 | 8,130 | 185,925 | 194,055 | 112,781 | 27,588 | 2,638,552 | 4,120,276 |
| 1,755,830 | 121 019 | 2,369,751 | 2,490,770 | 1,280,333 | 717,865 | 13,573.883 | 15,841,403 |
| 512,289 | 170,495 | 2,055.969 | 2,226,464 | 2,086,522 | 2,045,372 | 5,767,866 | 10,414,546 |
| 804,275 | 52,415 | 1,389,292 | 1,441,707 | 1,712,196 | 600,081 | 7,439,243 | 14,293,972 |
| ........... | 334 | 627 | 961 | ......... | 45,914 | 164,530 | 640,196 |
| 839,509 | 52,570 | 1,402,128 | 1,454,698 | 749,132 | 544.732 | 8,219,848 | 13,399,378 |
| 6,347 | 540 | 5,261 | 5,801 | 26,495 | 7,824 | 667,486 | 713,725 |
| 216,281 | 40,479 | 526,077 | 566.556 | 909,525 | 815,117 | 3,502,637 | 6,072,822 |
| 1,036,572 | 104,286 | 1,494,680 | 1,598,966 | 3,137,790 | 3,166,195 | 6,401,765 | 12,345 696 |
| 380,825 | 26,585 | 550,708 | 577,293 | 266,984 | 596,169 | 1,116,137 | 5 218,987 |
| 249,422 | 8,258 | 204,647 | 212,905 | 267,710 | 63,295 | 1,861,336 | 2,549,001 |
| 880,767 | 94,861 | 1,430,811 | 1,525,672 | 2,156,312 | 1,575 585 | 7,502,986 | 11,488,441 |
| 131,005 | 8,009 | 207,184 | 215,193 | 43,624 | 128,423 | 920,178 | 3,368,710 |
| 14,853,128 | 1,357,071 | 25,013,760 | 26,370 831 | 27.484,144 | 24,226,461 | 111,543,994 | 212,032 055 |
| 550 | 24 | 510 | 534 | 2,075 | 440 | 9,038 | 55,440 |
| .......... | ........ | .......... | ......... | ......... | ......... | ........... | 375 |
| ......... | 202 | 9,465 | 9,667 | ......... | 1,776 | .......... | 100,755 |
| 2 | ........ | .......... | .......... | 6,033 | 26,396 | 82,125 | 309,168 |
| 10 | 3 | ......... | 3 | 1,392 | 69,643 | 67,985 | 268,752 |
| ......... | 564 | 5,256 | 5,820 | ......... | 33,506 | ........... | 105,108 |
| 562 | 793 | 15,231 | 16,024 | 9,500 | 131,761 | 159,148 | 839,598 |
| 1,453,790 | 1,357,864 | 25,028,991 | 26,386,865 | 27,493,644 | 24,358,222 | 111,703,142 | 212,871,653 |

### *The number of Horses, Asses and Mules, Neat Cattle, Sheep and Swine, as returned by circular of assistant marshals of Census,* 1860.

| STATES. | Horses. | Asses and Mules. | Neat Cattle | Sheep. | Swine. |
|---|---|---|---|---|---|
| Alabama | 11,692 | 3,975 | 40,208 | 12,404 | 63,528 |
| Arkansas | 5,329 | 4,035 | 22,731 | 6,481 | 18,919 |
| California | 12,769 | 3,452 | 53,795 | 23,414 | 3,762 |
| Connecticut | 16,239 | 135 | 22,104 | 2,700 | 26,034 |
| Delaware | 3,791 | 440 | 6,779 | 559 | 7,969 |
| Florida | 4,562 | 2,145 | 78,836 | 1,675 | 26,092 |
| Georgia | 43,641 | 19,000 | 203,070 | 120,596 | 375,350 |
| Illinois | 114,163 | 7,700 | 218,459 | 33,822 | 254.380 |
| Indiana | 39,425 | 3,074 | 79,340 | 32,012 | 146 034 |
| Iowa | 36,018 | 2,054 | 94,184 | 22,267 | 130 891 |
| Kansas | 8,124 | 1,234 | 34,938 | 1,145 | 16,580 |
| Kentucky | 61,209 | 18,427 | 128,045 | 67,161 | 234,255 |
| Louisiana | 24 197 | 14,916 | 76,331 | 21,643 | 50,755 |
| Maine | 28,296 | 98 | 77,240 | 61,926 | 21 196 |
| Maryland | 9,224 | 880 | 9 555 | 1,135 | 15,113 |
| Massachusetts | 56,745 | 2 | 48,329 | 8.616 | 43,146 |
| Michigan | 30,601 | 151 | 80,760 | 47,916 | 57,316 |
| Minnesota | 8,063 | 479 | 29,823 | 2,473 | 19,718 |
| Mississippi | 2,445 | 595 | 6,881 | 1,062 | 3,175 |
| Missouri | 80,569 | 10,625 | 118,181 | 96,005 | 412.368 |
| New Hampshire | 12,881 | 6 | 21,254 | 6,191 | 17 423 |
| New Jersey | 28 519 | 6,022 | 41,664 | 12,093 | 71 516 |
| New York | 92,458 | 2,293 | 31,801 | 3,065 | 100 791 |
| North Carolina | 29,955 | 8,494 | 113,241 | 77,296 | 206,976 |
| Ohio | 117,101 | 3,240 | 222,956 | 132.653 | 317,116 |
| Oregon | 16,690 | 7,302 | 59,199 | 10,788 | 10,728 |
| Pennsylvania | 66,180 | 6,407 | 168,104 | 53,225 | 200,236 |
| Rhode Island | 7,191 | 49 | 6,144 | 5,455 | 7,242 |
| South Carolina | ..... | ..... | ..... | ..... | ..... |
| Tennessee | 21,925 | 8,871 | 58,512 | 29,854 | 108,577 |
| Texas | 95,497 | 13,082 | 861,646 | 320 926 | 198 261 |
| Vermont | 17,201 | 12 | 26,686 | 18,015 | 18,526 |
| Virginia | 42,786 | 6,608 | 143,535 | 112,591 | 198,121 |
| Wisconsin | 27,869 | 505 | 120,450 | 11,885 | 70,866 |
| TERRITORIES. | | | | | |
| Columbia, District of | 1,233 | 159 | 1,092 | 62 | 1,744 |
| Nebraska | 1,779 | 951 | 2,484 | 52 | 1.376 |
| New Mexico | 6,541 | 8,536 | 27,116 | 142,110 | 7,634 |
| Utah | 1,400 | 375 | 9,875 | 4,325 | 3,625 |
| Washington | 1,206 | 457 | 1,661 | 212 | 656 |
| Total | 1,185,514 | 166,786 | 3,347,009 | 1,505,810 | 3,467,905 |

# FACTS FOR FARMERS.

[The following facts for Farmers were compiled from European exchanges, and as they present a vast amount of ascertained results in a small compass, it was deemed not inappropriate to present them in this condensed form.

KLIPPART ]

*Covered and Uncovered Dung.*—Dr. Anderson thus describes the result of a series of experiments carried out by Lord Kinnaird, to determine the relative values of dung made under cover and in open courts: "A field was manured partly with covered and partly with uncovered dung, and the produce of potatoes determined; the whole then sown with wheat, and dressed in spring with 3 cwt. of Peruvian guano. The results are (omitting small fractions):

| | Uncovered Dung. | Covered Dung. |
|---|---|---|
| Potatoes | 7 tons 12 cwt. | 11 tons 15 cwt. |
| Wheat grain | 42 bushels. | 54 bushels. |
| " straw | 156 stones. | 215 stones. |

In estimating the value of farm-yard manure, it is a general habit to assume that a certain fraction of the cattle food remains in it, and that the cost of part of this food is withdrawn from the expense of feeding the cattle, and taken as representing the cost of reproducing the manure. Dr. Anderson, on this point, gives the following: "I must confess I have always been of opinion that there is no way in which a farmer is more likely to deceive himself, the proportion of the food which is thus to be referred to the manure-heap being mere guess-work, unsubstantiated by experiment, and generally overrated; as, for instance, when we hear of one-third of the price of oil-cake being debited to the manure. It would be much wiser to ascertain the expenses of feeding, irrespective of the manure-heap, and then, of course, if there is a profit upon it, the manure is got without cost, and nothing but the expense of application is to be estimated; if, on the other hand, there is a loss, that loss is the cost of the production of the manure; and it must be the object of the farmer to see that it does not exceed the price at which farm-yard or artificial manures can be purchased."*

*Artificial Manures.*—A knowledge of the effects obtainable by these manures has given a wonderful impetus, of late years, to their manufacture and use. It is of importance, then, for the farmer to know the exact position they occupy as fertilizing substances, how far they are calculated to supplement farm-yard manure, and how best their value can be estimated. In a lecture delivered by Dr. Voelcker, and printed at length in the 5th volume of the Journal (new series) of the Bath and West of England Society, a large amount of valuable information on the subject is given, as also in a lecture by Dr. Anderson, delivered during the Highland Society's show, at Dumfries, 1860, and fully reported in the Society's "Transactions" for October.

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* Highland Society's Transactions.

And first, noticing the paper read by Dr. Voelcker, we have to point out the fallacy of the opinion pretty generally prevalent—at least, at one time so—that artificial manures are universal manures, applicable to every description of crop, and are equal to the best home-made or farm-yard manure. They are not so; they are merely valuable supplements to farm-yard manure, enabling "the intelligent agriculturist to make one ton go twice as far as it would without the simultaneous use of artificial manures." Farm yard manure, as we have already said in this section, exercises a mechanical effect upon the soil, in addition to a chemical; artificial manures, on the contrary, exercise only a chemical, and should be looked to rather as the direct food supplied to plants, and which is supplied to plants by farm-yard manure to an inconsiderable extent only.

Farm-yard manure has entering into its composition substances which are present in the soil in abundance, or by means of the straw or litter applied to it; these, as lime, magnesia, sand or silica, oxide of iron, and alumina, are of little value; but it has other constituents—nitrogen, phosphate of lime—and these, though small in amount, produce wonderful effects. Alkalies, as potash and soda, are also required by all agricultural plants, nay, are absolutely essential for their existence. Now, these fertilizing matters being of comparatively easy concentration in artificial manures, hence their value; they contain large quantities of the substances which are present in small quantities in the soil, and of which plants require larger supplies than can be given through the medium of farm-yard manure. "The great value," then, "of artificial manures depends upon the circumstance that they present these important constituents in a concentrated state."

In the use of artificial manures it is of importance for the farmer to remember that good crops cannot be secured merely by their aid alone: mechanical cultivation of the soil is essential; super-phosphates, for instance, will sometimes fail in cases where the pulverization of the soil was neglected.

Again, the efficacy of artificial manures is greatly influenced by the chemical composition of the land to which they are supplied. Thus in the soils resting upon the green-sand formation, and which contain ample funds of phosphate of lime to meet all the requirements of the crops; manures containing bone material or phosphate of lime have no effect. Still further, there are other conditions which influence the efficacy of artificial manures. Thus guano, or nitrate of soda, if used as a top-dressing for wheat or oats too late in the season, much of their effect is lost. Wheat should not be top-dressed later than February—in clay soils it may be advisable to use it in autumn. Used late in spring, much of the useful effect of such manures is lost. Again, the mode in which they are applied influences their efficacy. Apply guano in hard lumps, its effects will not be so striking as when it is applied in a pulverized condition, or perhaps mixing it with sand or salt. In addition to all these controlling influences, must be mentioned those of the weather, and the diseases of the plants to which the manures have been applied.

*Classification of artificial Manures according to their Action.*—The classification of artificial manures, to be strictly correct, is a matter of some difficulty. They might, as Dr. Stöckhardt (see *Chemical Field Lectures*, Trübner & Co., p. 71) remarks, be arranged according to their chemical constituents, but in attempting this, "difficulties of an insurmountable kind" are met with. "The greater number of manures are complicated mixtures of three, four, five, six, and more elements, which is the most important? Notwithstanding the thousands of experimental and practical deductions respecting manure, we still know nothing positive and irrefragable with regard to the action of the *separate* elements, and far less upon the question of how they comport themselves in combination with each other. One and the same substance may operate, moreover, in two, three, four, or more ways; its action varies according to its form, as also according to the soil to which it is applied, the kind of crop for which it is used, and so forth."

Professor Voelckler in the *Journal of Agriculture*, March, 1852, gives the following list of artificial manures "according to their action and composition, in an order which begins with the most powerful, and ends with the weakest manure. Some of the materials occur under several heads, wich is an indication that they contain more than one chemical compound, and therefore act in more than one way.

"1. *Nitrogenized Manures* (*forcing Manures*).

"*a.* Substances containing ammonia (very quick-acting manures).

Ammoniacal salts.
Peruvian guano, soot.
Putrid animal substances; for instance, blood, flesh, wool.
Ammoniacal water of gas-works.
Putrid urine, putrid liquid manure.
Short dung, particularly sheep, and horse dung.

"*b.* Nitrogenized matters which pass easily into putrefaction (tolerably quick in their action).

Horn shavings, glue.
Bones, dissolved, steamed, or finely powdered.
Oilcakes of all kinds, malt-dust.
Fresh urine, fresh liquid manure.

"*c.* Nitrogenized manures, which decompose with difficulty (slowly acting forcing manures).

Half-inch bones.
Woolen rags.
Long dung.

"*d*. Substances containing nitric acid (quick-acting forcing manures).
Saltpetre.
Chili saltpetre (nitrate of soda).
Nitre earth.

"2. *Carbonaceous Manures* (*Humus forcing Manures*).
Common farm-yard dung, straw, leaves of trees, &c.
Sawdust, green manures.
Peat, or vegetable remains of all kinds.

"3. *Manures containing much Potash* (*strongly forcing Manures*).
Potash, nitre, malt-dust.
Urine, wood ashes.
Leaves, and green manures.
Road-scrapings, compost.
Burnt clay, some kinds of marl.

"4. *Manures containing principally Soda* (*less effective Manures*).
Common salt
Nitrate of soda, urine.
Several minerals.
Soap-boilers' refuse.

"5. *Phosphatic Manures* (*Grain or Seed forcing Manures*).
Burnt bones, animal black, refuse of sugar manufactories.
Phosphate, apatite, coprolites.
Saldanha Bay guano.
Fresh bones, bone-dust.
All sorts of guano.
Animal matters of all description.
Oil cakes, malt refuse.
Human excrements, farm-yard manure.
Urine of carnivorous animals.
Wood ashes, straw, leaves, &c.

"6. *Manuring Matters containing sulphuric Acid* (*partly Manures themselves, partly Fixers of Ammonia*).
Gypsum, sulphuric acid.
Green vitriol.
Coal ashes, peat ashes.

"7. *Calcareous Manures.*
Burnt lime, chalk marl.
Gypsum, coal and peat ashes.
Road-scrapings, gas lime.

"8. *Siliceous Manures.*
Coal ashes, peat ashes.
Farm-yard manure, sand, straw, &c."

*Main Desiderata to be sought in the Choice of Manures.*—On this point Mr. Dymond, in vol. v., p. 9, of the *Journal of the Bath and West of England*, has the following:—"It is now generally known, that each variety of soil demands a particular mode of cropping, and the addition of certain ascertainable proportions of various manuring substances, in order that the intended crop may be supplied artificially with the food not naturally found in the soil, or not given in sufficient abundance by the atmosphere or the rain. Thus, if grass be the object of cultivation, there will be a large and constant demand for nitrogenous or ammonia-producing manures. If heavy grain-crops be desired, we know that besides a good supply of ammonia, the carbon of the straw, and (as some say) its silicious coating must be provided in the selection of our manures, if these ingredients are deficient in the soil. Again, if roots be the subject of culture, phosphates, as contained in bone-dust, superphosphate of lime, &c., should predominate."

*Calculating the Money Value of Manures.*—The following gives the various ingredients of manures, and the price per ton. Suppose the analysis of the manure, say a superphosphate, to be before us, we proceed as follows: we multiply the percentage quantities in the analysis by the price per ton of the particular ingredient, as shown by the following table; we then add up the various items, and divide the amount by 100, so as to obtain the price of a single ton.*

| | | | | In 100 tons. | | |
|---|---|---|---|---|---|---|
| Analysis. | | | £. | £. | s. | d. |
| Organic matter | 17 per cent. | 17 tons at | 1 = | 17 | 0 | 0 |
| Soluble phosphate | 16½ " | 16½ " | 33 = | 544 | 10 | 0 |
| Insoluble phosphate | 13 " | 13 " | 7 = | 91 | 0 | 0 |
| Sulphate of lime | 41 " | 41 " | 1 = | 41 | 0 | 0 |
| Alkaline salts | 2 " | 2 " | 1 = | 2 | 0 | 0 |
| Ammonia | 1 " | 1 " | 56 = | 56 | 0 | 0 |
| | | | Divide by 100 ) | 751 | 10 | 0 |
| | | | | £7 | 10 | 0 |

| Ingredients. | Per ton. | | |
|---|---|---|---|
| Ammonia in sulphate | £68 | 3 | 0 |
| " muriate | 89 | 12 | 0 |
| " as supplied by bones | 45 | 9 | 0 |
| " " dried blood | 55 | 0 | 0 |

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* From a paper by Dr. Way on the "Value of Artificial Manures," in the Journal of the Royal Agricultural Society, vol. xvi p. 539.

| Ingredients. | Per ton. | | |
|---|---|---|---|
| Ammonia as supplied by Peruvian guano | 44 | 2 | 0 |
| “ “ nitrate of potash | 140 | 0 | 0 |
| “ “ “ soda | 89 | 1 | 0 |
| Biphosphate of lime | 48 | 3 | 0 |
| Soluble neutral phosphate of line | 32 | 13 | 4 |
| Phosphate of lime in coprolite | 6 | 5 | 0 |
| “ “ bone ash | 8 | 11 | 5 |
| “ “ animal charcoal | 8 | 2 | 2 |
| “ “ bones | 5 | 14 | 4 |
| “ “ Peruvian guano | 5 | 11 | 0 |
| Potash in sulphate | 30 | 16 | 0 |
| “ nitrate | 45 | 14 | 0 |
| “ American ashes | 72 | 16 | 0 |
| Magnesia in sulphate | 31 | 14 | 0 |
| Soda in sulphate | 13 | 14 | 9 |
| “ supplied by common salt | 1 | 17 | 9 |
| Organic matter, nitrogenous | 1 | 0 | 0 |
| “ non-nitrogenous | 0 | 10 | 0 |
| Alkaline salts | 1 | 0 | 0 |
| Sulphate of lime | 1 | 0 | 0 |
| “ soda (dry) | 5 | 15 | 0 |
| “ potash | 16 | 13 | 0 |
| “ magnesia (dry) | 11 | 7 | 0 |
| Sulphuric acid (real) in sulphate of lime | 2 | 11 | 6 |

*Adopted Average.*

| | £. | s. | d. |
|---|---|---|---|
| Nitrogen | 68 | 0 | 0 |
| Ammonia | 56 | 0 | 0 |
| Phosphate of lime | 7 | 0 | 0 |
| Soluble phosphate of lime | 32 | 13 | 4 |
| Potash | 30 | 16 | 0 |

*Farm-yard Manure and Peruvian Guano for the Turnip Crop*—“Its peculiar advantages (guane) are as an auxiliary, which supplies a quantity of certain constituents in an immediately available condition, in which they are requisite for producing the rapid growth of the crop through the early stages of its existence; and the enormous mass of farm-yard manure which must be used where large crops are expected is dependent to some extent on the small quantity of its constituents which exist in that condition; so that we generally employ a larger total quantity of the valuable constituents of farm-yard manure than is required for the whole rotation, merely that by doing so we may get a sufficiently large amount of those which we wish to act rapidly. The peculiar merit of guano is, that by mixing it with farm-yard manure we can bring up the quantity of immediately available constituents, without adding unnecessarily to those which are to be long dormant in the soil. The practical fact is, that under liberal management, by farm-yard manure alone, a soil becomes gradually richer in organic matter, ammonia and phosphates; and it is quite possible, so long as that excess remains, to raise crops by the addition of the rapidly-acting manure alone; but it is a system which the good farmer will only employ under exceptional cases." Guano, if depended upon alone, will, in the long run, be inferior to farm-yard manure. "I question much whether it could be successfully carried out through a series of several rotations, even if we took care to add all the valuable matters removed by the crops; and the reason is, that farm-yard manure not only adds the constituents which the crop has removed, but has another function to perform on the soil itself, the importance of which we are apt to overlook. It is a source of carbonic acid, which is being gradually evolved by the fermentation which is constantly going on in it; and that carbonic acid acts slowly upon the mineral part of the soil, decomposes it, and disintegrates it, and brings its constituents into a state in which they are available to the plant." *

*Potato Manure.*—"The substances that ought to be present in a potato manure are the following, arranged according to their *several proportions*:

Bases,
Potash,
Magnesia,
Soda,
Lime,
Acids,
Sulphuric acid,
Phosphoric acid,
Chlorine.

"Oxide of iron and silica are present in every soil, and the organic acids are produced within the plant itself. The proportions are the following per ton: †

| | lbs. | | lbs. |
|---|---|---|---|
| Potash ................ | 1180 | Sulphuric acid............ | 416 |
| Magnesia .............. | 87 | Phosphoric acid.......... | 235 |
| Soda .................. | 87 | Chlorine ................ | 195 |
| Lime .................. | 50 | | |

*Value of Potato-Tops as a Manure.*—Containing a large quantity of valuable ingredients, we at once see the value of the system generally adopted in the practice of plowing in the tops. The value of the tops is increased from the large quantity of various nitrogenous compounds, which assist directly in the formation of new nitrogenous compounds. The average proportion of nitrogen in the leaf is stated by Dr. Fromberg, in 100 lbs. in the natural state, as from 0·82 to 0·92 lbs.; and in 100 lbs. of dry leaves, from 5·12 to 5·76 lbs. Every ton of potato-tops plowed in as a manure adds 50 lbs. of inorganic salts, and a quantity of organic matter containing 20 lbs. of nitrogen, or 23 lbs. of ammonia. Compared with the best Ichaboe guano, 1 ton of potato-tops is equivalent to 2½ cwt. of it.

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* Dr. Anderson.—Highland Society's Transactions, vol. for 1852, p. 434.

Fromberg on the Potato.—Highland Society's Transactions, vol. for 1847, p. 689.

*Top-dressing for Wheat.*—The following are analyses of the manures used in the experiments under the above title :

### *Analysis of Proctor's Wheat Manure.*

| | |
|---|---|
| Moisture | 13·60 |
| Sulphate of ammonia[*] | 10·97 |
| Soluble nitrogenized organic matter[†] | 8·08 |
| Insoluble " " " | 14·72 |
| Biphosphate of lime | 3·54 |
| Equal to bone-earth rendered soluble by acid | (5·52) |
| Insoluble phosphate of lime (bone-earth) | 9·45 |
| Sulphate of magnesia | 0·61 |
| Hydrated sulphate of lime | 19·73 |
| Chloride of sodium (common salt) | 16·84 |
| Insoluble siliceous matter (sand) | 2·46 |
| | 100·00 |

This manure is characterized by Dr. Voelcker as an "excellent fertilizer" for wheat.[‡]

### *Analysis of Nitrate of Soda.*[§]

| | |
|---|---|
| Moisture | 1·87 |
| Pure nitrate of soda | 95·68 |
| Chloride of sodium | 0·79 |
| Sulphate of soda | 1·17 |
| Sand | 0·49 |

### *Analysis of Peruvian Guano.*[‖]

| | |
|---|---|
| Moisture | 17·12 |
| Organic matter and ammoniacal salts[¶] | 51·31 |
| Phosphates of lime and magnesia (bone-earth) | 22·55 |
| Alkaline salts | 7·94 |
| Insoluble siliceous matter (sand) | 1·08 |
| | 100·00 |

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| | |
|---|---|
| [*] Containing nitrogen | 2·32 |
| Equal to ammonia | 2·82 |
| [†] Containing nitrogen | 3·53 |
| Equal to ammonia | 4·28 |
| Total quantity of nitrogen | 5·85 |
| Equal to ammonia | 7·10 |

[‡] See Journal of Royal Agricultural Society, vol. xx. p. 321.

[§] Dr Voelcker. [‖] Id.

| | |
|---|---|
| [¶] Containing nitrogen | 14·64 |
| Equal to ammonia | 17·77 |

### *Analysis of Chalk Marl.*

| | |
|---|---|
| Moisture | 2·49 |
| Carbonate of lime | 69 23 |
| Oxide of iron and alumina | 0·36 |
| Phosphate of lime (bone-earth) | 0 63 |
| Sulphate of lime | trace |
| Magnesia and alkali | 0 45 |
| Soluble Silica | 8 29 |
| Insoluble siliceous matter (sand) | 18·55 |
| | 100 00 |

*Measure for Turnips in Light Soils, where they are apt to become "Fingered and Toed."*—Two tons of lime per acre, with as much dung as can be spared, applied in February, with 1½ cwt. of superphosphate, drilling this with the liquid manure drill, when sowing.

*Dissolved Bones.*—Mixture for 1 acre:—42 lbs. or 1 bushel of bones, 17½ lbs. of sulphuric acid, 9 lbs. of water, and 10 bushels of ashes. Sprinkle the bones with water before the acid is applied.

*Manure for Barley.*—"Of direct portable manures for barley," say Dr. Gilbert and Mr. Lawes, in the *Journal of the Royal Agricultural Society*, vol. xviii. "Peruvian guano or salts of ammonia, or nitrate of soda, either of them, with a small quantity of superphosphate, are the best." These should be applied before or at the time of sowing, in order to distribute them well through the soil, and near its surface. "As a mere top-dressing, nitrate of soda is the best. Of the more exclusively nitrogenous manures, salts of ammonia and nitrate of soda, the nitrate acts somewhat more rapidly for a given amount of nitrogen supplied. The action of the purely nitrogenous manures is economized by admixture with a small quantity of superphosphate of lime, or other appropriate mineral manure. Other things being equal, the later the barley is sown the less should be the proportion of nitrogen in the manure, and the greater that of the mineral constituents; otherwise, the crop is liable to be too luxuriant, and with a limited range of root in the soil it will probably not find mineral constituents rapidly enough in the later stages of growth for a favorable development and maturing of the seed."

*Manures or Composts for the Hay Crop, per Acre, where Fold or Farm-yard cannot be obtained.*—The following are given by Mr. Bowditch, in the essay already referred to: 1. *Near Towns, where Dung can be purchased.*—Manure, 3 tons; earth, 3 tons; common salt, 1 cwt. This should be well mixed and turned, and well watered with liquid manure. 2. Where shoddy can be obtained, but manure cannot.—Shoddy, 1 ton; earth, 3 tons; bone-ash, 1 cwt.; common salt, 1 cwt.; sulphate of magnesia, ½ cwt.: mixed, well watered, and turned twice. 3. Where soot is easily available.—Soot, 8 cwt. or 32 bushels; earth, 3 tons; bone-ash, 1 cwt.; sulphate of magnesia, ½ cwt.: mixed and turned once. 4. Guano may be employed in the following economical and efficient mixture: best Peruvian guano, 2½ cwt.; common salt, 1 cwt.; sulphate of magnesia, ½ cwt.; earth, 1 ton. 5. Rape-dust may be used economically, and for a change efficiently, thus: rape-dust, 5 cwt.; common salt, 1 cwt.; earth, 2 tons.

Mr. Thompson, in the essay on the "Management of Grass Land," *Journal of Royal Agricultural Society*, vol. xix. p. 262, gives the following as an effective manure for grass-lands: "Equal weights of best Peruvian guano, nitrate of soda, and common salt, to be used in early spring, at the rate of 3 or 4 cwt. per acre, according to the condition of the land."

Messrs. Lawes and Gilbert give the following as a generally useful top-dressing for the hay crop: Peruvian guano, 3 parts; nitrate of soda, 1 part; sulphate of ammonia, 1 part; of this 2 to 2½ cwt. per acre may be applied "annually, and the application of 10 or 12 tons per acre of poor rotten dung once every 4 or 5 years, a good crop of hay may be taken off every year, without injury to the land. The best time of sowing the 'artificial' manures is generally in January, and it should, at any rate, be seldom postponed beyond February. Peruvian guano, when used alone, may be employed at the rate of from 1½ to 2½ cwt. per acre; nitrate of soda alone, or sulphate (or muriate) of ammonia, at the rate of 1½ to 2 cwt. per acre."*

*Manures for the Improvement of Grass Lands.*—(1.) *Lime Compost*—"This," says Professor Tanner, in his essay on the "Management of Grass Lands," in *Bath and West of England Society's Journal*, vol. v. new series, p. 77, "is of great value, and will be found especially useful when the land is mossy." To make this compost, the Professor states that the scouring of ditches, road-scrapings, weeds, sods, bog earth, and, in fact, any vegetable matter not suitable for the farm-yard manure-heap should be collected, and intermixed with lime fresh from the kilns, and partially slaked with water. The proportion of lime to the vegetable matter, should be one cartload to three of the refuse matter, if peculiarly rich in vegetable matter, if poor, the proportion of refuse to the lime may be increased from three to nine cartloads. The mixed heap may rest for four or six months, then be turned over and well mixed, this being repeated a month before using it. It should be applied at the rate of thirty loads per acre, at the commencement of spring, and after being spread, the land should be dragged, rolled, and bush-harrowed.

(2.) *Wood or coal ashes* are valuable for bringing up a close plant of clover.

(3.) *Bone-dust* applied at the rate of one ton per acre in the autumn.

(4.) *Superphosphate of lime*, of high value as a manure for grass land.

(5) *Guano.*

(6.) *Nitrate of soda.*

*Caution in using Artificial Nitrogenous Manures as Guano, or Nitrate of Soda for Grass Land.*—On this point Professor Tanner states that "in too many cases they are rendered useless, if not possibly injurious to the land, by the manner in which the land is subsequently dealt with. Being powerful fertilizers and very quick in action, a rapid growth of grass follows their employment, and the result is, it thus becomes such a temptation for the scythe that few are able to resist it. The crop is cut, and in proportion as the soil is light in its character and generous in its nature, it becomes impoverished, and the herbage weakened by the injudicious use of a stimulating manure. This does not happen upon stronger and more retentive soils, which are slower in their action, and hence more durable. In the use of these stimulating manures, it should be remembered that they excite the growth of vegetation in such a manner that not only is the manure which has been applied, taken up, but it *stimulates* the plant to fresh energy in the search of food from other sources, the soil and the atmosphere. If, therefore, the crop were consumed upon the land, its fertility would be very much increased, and a future crop might be removed with far less injury to the land, but this is seldom done, and hence guano and similar manures are often condemned as injurious to the *quality* of the herbage after the first effect has passed off. The combined use of superphosphate of lime with the guano is far preferable to the use of the latter alone."

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* Journal of the Royal Agricultural Society, vol. xix. p. 573.

*Manure for Improving the Natural Herbage of Hills and Commons.*—The following is that recommended by Professor Tanner as the quantity for an acre:—Guano, ½ cwt.; superphosphate of lime, ¼ cwt.; wood-ashes, 20 bushels.

*Quantity of lime applied to land in different counties per imperial acre:*

| Counties. | Bushels. | | Years. | Bushels in a Year. | When applied. |
|---|---|---|---|---|---|
| Roxburgh........ | 200 | every | 19 | or 10½ | ....To the fallows. |
| Ayr (Kyle) ...... | 40 | " | 5 | " 8 | ....To the fallows or lea. |
| Carse of Sterling.. | 50 | " | 6 | " 9 | .... " " |
| South Durham ... | 90 | " | 12 | " 8⅛ | .... " " |
| Worcester ....... | 70 | " | 6 or 8 | " 10 | ....Before grasses or tares. |

It thus appears that in those counties, 8 to 10 bushels a year are pretty uniformly applied. On very stiff soils, or on peaty land, a larger dose, no doubt, can be used with advantage; but on light soils, it is advisable to use it in smaller doses. Some farmers prefer using large doses at once, whilst others maintain that repeated dressings with smaller doses are attended with the greatest amount of practical benefit.

There can be little doubt that, in soils abounding in vegetable matter or wholly destitute of lime, a large quantity will be required at once to change their mechanical and chemical constitution, and the propriety of liming the land heavily at first is thereby indicated.

But when the land has been brought by cultivation into good condition, the safest plan to maintain it in fertility will be to supply lime at shorter intervals with smaller doses at the rate of about eight bushels a year.

Repeated liming with small doses at longer or shorter intervals, indeed, is necessary to keep the land in its maximum state of productiveness. The reasons for the practice are obvious. In the first place, the well-known tendency of lime to sink deeper and deeper into the soil from year to year, removes the lime from the surface into the subsoil, and thus takes it out of the reach of the plants. This tendency to sink is greater in light and porous soils than in heavy, but even in very stiff land lime gradually sinks and passes into the subsoil. Hence the necessity of applying it as near as possible to the surface.

Secondly, heavy rains wash it down into the lower strata, and dissolve also considerable portions of it. It is on account of this dissolving action that badly-drained soils require to be more frequently limed than those which are well drained.

In the third place, it will be remembered that all our cultivated crops remove a certain portion of lime from the soil, and as some crops take up a much larger quantity than others, the course of cropping must necessarily influence the period at which liming ought to be repeated.*

*Soils to which Lime can be employed with advantage.*—All stiff clay soils nearly, and those in the districts where the old red sandstone rocks prevail, are much benefited by it. It is of the greatest utility on the clays of the granite and clay-slate. Heavy doses are of extreme utility on new land or that which has been long pastured ; as much as 150 to 300 bushels per acre may be applied. Peaty soils are greatly improved by lime.

Good as are the effects of lime on heavy land, they are no less striking on light land. Indeed, all soils deficient in this essential element, are rendered more productive by the use of lime.

*Soils not benefited by Lime.*—As a general rule, those which contain more than 4 per cent. of lime should not have lime applied to them. Such is the opinion of Dr. Voelcker who gives the following means—

*To ascertain the Soils likely or not likely to be benefited by Lime.*—"Put a small quantity of soil in a tumbler, and pour upon it, first a little water, and then a good deal of spirits of salts, or muriatic acid. If this addition produces a strong effervescence, there is no need of applying lime to the land ; if no effervescence is produced, in all probability liming or marling will be useful. However this simple test cannot always be depended upon, and it is therefore much safer to have the proportion of lime determined in the soil, which at no great expense can be done by an analytical chemist."

*Superphosphate of Lime.*—This manure is prepared by pouring sulphuric or muriatic acid over bones. It is by far the most economical way of applying bones, and the effects are more immediate from its being presented to the plants in a condition readily to be taken up by them. It is essentially the manure for the turnip crop, especially the Swedes, causing that rapid development in the leaves, so necessary to secure the plants against the ravages of the fly. Superphosphate may be regularly and easily obtained in the market ; but as there is great tempration to adulterate it, a temptation to which not a few manufacturers have given way, it is perhaps the best way to make it upon the farm.

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* Dr. Voelcker in Bath and West of England Society's Journal, vol. vi. new series, p. 252.

Dr. Anderson gives the proportion of bones and acid to be employed as follows:

1 ton of inch bones.
¼ ton of sulphuric acid.
60 gallons or ¼ of a ton of boiling water.

The requisites he recommends, are a cistern of lead, or even of wood strongly made and bolted together, and a watering-can of lead. "A small quantity of the bones should be spread upon the bottom of the cistern, and the sulphuric acid gradually poured in from the leaden watering-can, at the same time that a proportionate quantity of the water is added from another watering-can. More bones should then be thrown in, then more acid and water; and in short the process should be managed so as to intermix the bones, water, and acid, as uniformly as possible. The mixture should be allowed to stand for some days before it is employed, and it should then be mixed with some dry peat or soil, in order to render it sufficiently dry for use. The mixture thus made, may be preserved for any length of time before being used, so that it may be made at any time which may suit the other operations of the farm; all that is necessary being that it shall be kept under cove.r"*

*Coprolites.*—Phosphatic nodules, of a round, stony appearance, of a brown iron color, "the fossil excrements of saurian and other animals" There are two classes of coprolites, the "true" and the "pseudo." The true coprolites are found abundantly in the lias, in the green sand, and in the Suffolk crag. They "consist," according to Dr. Playfair, "of phosphates of lime, phosphates of magnesia, corbonate of lime, and various other bodies. Their composition obviously results from their origin. The excrements of all animals especially of reptiles, contain a large amount of phosphates." Dr. Gilbert found the percentage of phosphate of lime (bone earth) in coprolites, which he analyzed, to be as much as 55 to 57 per cent.† The following is an analysis by Mr. J. J. Herapath.‡

| | | |
|---|---|---|
| Water | 3·400 | |
| Organic matter | trace | |
| Silica | 13 240 | |
| Carbonate of lime | 28 400 | |
| Phosphates of lime, magnesia, iron, &c. | 53·730 | = phosphoric acid 26·615 |
| Sulphate of lime | 0·736 | |
| Loss | 0·586 | |

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* Highland Society's Transactions, 1851, p. 44.

† See Cyclopedia of Agriculture, vol. i. p. 545.

‡ Journal of Agriculture, vol. for 1849, p. 74.

*Composition of* 1,000 *parts of the Urine of different Animals.*

| | Water. | Organic matter. | Mineral matter. |
|---|---|---|---|
| Horse | 904·8 | 54·9 | 40·3 |
| Cow | 913·6 | 55·0 | 31·4 |
| Calf | 993·8 | 2·4 | 3·8 |
| Sheep | 894·3 | 79·8 | 25·9 |
| Goat | 982·0 | 8·8 | 9·2 |
| Pig | 981·6 | 5·0 | 13·4 |

*Quantity of Urine voided by the Horse, Cow, Sheep, and Pig, annually.*—Horse 3,000 lbs.; cow 8,000 lbs.; sheep 380 lbs.; pig 1,200* lbs.

*Composition of* 1,000 *parts of human urine.*

| | |
|---|---|
| Water | 933·0 |
| Organic matter, very rich in azote | 48·6 |
| Sulphate of potash | 3·7 |
| " soda | 3·2 |
| Phosphate of soda | 2·9 |
| Bi-phosphate of ammonia | 1·7 |
| Sal-ammoniac | 1·5 |
| Marine salt | 4·4 |
| Sulphate of chalk and magnesia | 1·0 |
| | 1000·0 |

*Proportion of Fertilizing Ingredients.*—"Urea," by its decomposition, producing ammonia, *in various urines.*†

| Animal. | Authority. | Water. | Urea. | All other Substances. | Total Parts. |
|---|---|---|---|---|---|
| Man | Berzelius | 93·3 | 3·01 | 3·69 | 100·0 |
| | Becquerel | 97·05 | 1·35 | 1·60 | 100·0 |
| Horse | Fourcicroy and Vauquelin | 94·0 | 0·7 | 5·3 | 100·0 |
| | Boussingault | 91.07 | 3·1 | 4·23 | 98·4 |
| Cow | Boussingault | 92·13 | 1·8 | 4·47 | 98·4 |
| | Sprengel | 92·6 | 4·0 | 3·4 | 100·0 |
| Sheep | Sprengel | 96·0 | 2·8 | 1·2 | 100·0 |
| Pig | Boussingault | 97·91 | 0·49 | 1·6 | 100·0 |

The experiments of Sprengel show very conclusively the importance of *an immediate mixing or diluting the urine of farm stock with water,* "if we would preserve urine for use in a liquid form; since, in the unmixed urine, there were but

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* Stockhardt.

† Dymond on "Liquid Manure," Journal of Bath and West of England Society, vol. v. new series, p. 3.

·487 parts of ammonia left in the manure, as against 1·622 in the sample to which water had been added, whilst the urea had been diminished only ·400."

These experiments showed, in other words, that where the urine was diluted with an equal bulk of water, it contained nearly four times as much ammonia left to putrify in its natural state. In its undiluted state, the ammonia escapes into the atmosphere.

### *Soils, according to Dr. Voelcker, on which liquid manure can and cannot be applied with advantage.*

"Experience has shown that liquid manure produces the most beneficial and most striking effects when applied to light, deep, sandy soils, resting upon a porous subsoil. However poor originally such a soil may be, after repeated applications of liquid manure, it is rendered capable of yielding remunerative and even large crops. Witness, for instance, the almost sterile sands which abound in Flanders, and the astonishing change which it effects upon them.

"Provided the subsoil be well drained, or of a porous nature, it may be safely asserted that any sandy soil, however sterile in its natural state, may be made to yield heavy crops through the instrumentality of liquid manure. Indeed, the poorer the soil the more striking would be the result.

"For poor, sandy soils the system of liquid-manuring cannot be too highly recommended; for I believe that all other plans of applying fertilizing materials to them will be found far less efficacious in their results.

"If we examine into the chemical and physical characters of soils similar to those which abound in Flanders, we shall not be long in discovering the causes of the astonishing success which has crowned the system of liquid-manuring in Belgium and other countries.

"Might not liquid manure produce a good effect upon sterile clay land? I do not think it would produce a very marked effect; for I conceive that the close texture, coldness, and want of porosity which characterize sterile clays, are opposed to the successful application of liquid manure. As just observed, only a small portion of such soils can be penetrated by the tender roots of plants, whilst by far the larger part of the soil enriched by the liquid manure is out of their reach. Consequently, most of the liquid manure would be lost under these circumstances, and the small quantity left in the portion of soil penetrated by the roots cannot of course produce any very striking result.

"Moreover, all clay soils are generally more than sufficiently wet during the early part of the year; the additional quantity of water supplied in liquid manure renders them wetter still; and as much heat is absorbed during the evaporation of water, the injury done to the land by the resulting cold would not, I imagine, be counterbalanced by the small proportion of fertilizing matters supplied.

"Again, clay soils, whether fertile or barren, and all land that is moderately stiff, like the majority of soils in England, must, by a heavy dose of liquid manure, be rendered closer. Such soils certainly would not be improved in their physical character by an excess of water. The use of liquid manure at a time when such land is more than sufficiently wet is therefore objectionable; but it is equally objectionable when stiff soils get too dry. In summer, soils of that description crack in all directions, and the liquid manure then runs through the cracks instead of passing through the soil, or it moistens the soil but very imperfectly. Much of the liquid manure is thus lost, and, moreover, injury is done by the insufficient proportion of manure that is absorbed by a thin layer of the surface-soil; for it causes at first a more rapid development of the young plants, which receive a sudden check as soon as the small quantity of moisture is all evaporated.

"We thus observe that, generally speaking, neither the chemical nor physical characters of clay soils, and others partaking more or less of the same nature, are favorable to the introduction of the system of liquid-manuring. And since by far the greater part of the cultivated land in this country is more or less retentive, I feel assured that liquid manure will never be extensively employed by British agriculturists, but that its use will be confined to land of a light porous character." *

*Composition of 1,000 parts, according to Berzelius, of fresh human excretæ:*

| | |
|---|---|
| Water | 733 |
| Debris of food | 70 |
| Organic matter | 45 |
| Soluble in water<br>Insoluble in water | 140 |
| Mineral saline substances | 12 |
| | 1,000 |

In 1,000 parts of the mineral substances of the above, the following were found:—

| | |
|---|---|
| Carbonate of soda | 294 |
| Marine salt | 235 |
| Sulphate of soda | 118 |
| Phosphate of chalk | — |
| Phosphate of ammonia and magnesia | 235 |
| Silica, sulphate of chalk (traces) | 118 |
| | 1,000 |

The following is Dr. Anderson's analysis of human excretæ: the solid matter was found to contain 88·16 per cent. of water, and the dry residuum had the following composition:—

| | |
|---|---|
| Organic matter | 86·75 |
| Phosphates | 8·19 |
| Alkaline salts | 2·50 |
| Silicious and insoluble matter | 2·53 |

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* From a paper on "Liquid Manure," by Dr. Voelcker, in the Journal of the Royal Agricultural Society, vol. xix. p. 519.

| | |
|---|---|
| Nitrogen | 4·59 |
| Equal to ammonia | 5·57 |
| Sulphuric acid in the alkaline salts | 1·18 |
| Equal to phosphate of lime | 2·55 |

A valuable manure, worth £4 8*s.* per ton; estimating ammonia at £56, soluble phosphates at £28, and insoluble phosphates at £7 per ton. This would be increased by allowing £1 per ton for organic matter.

*Proportion of water in different Manures.*

| MANURES. | Per centage of water. | Proportion of solid parts to 1 of water. | Authority. |
|---|---|---|---|
| Peruvian guano | 12 to 17 | 6 to 8½ | Voelcker. |
| Superphosphate of lime | 20 | 5 to 8½ | Voelcker. |
| Rich stable manure | 75 | 1 3rd | Lawes. |
| Urine of horses | 91 | 1-10th | Boussingault. |
| " cows | 92·6 | 1-12th | Sprengel. |
| " pigs | 97·2 | 1-46th | Boussingault. |
| Town sewerage | 99·9 | 1,200 parts water to 1 of solid matter. | |

*Productive value of different Manures*, as stated by M Girardin in his *Traité Elémentaire d'Agriculture.*—Supposing a piece of land without manure gives a yield of three times the quantity of seed sown; the same land manured with vegetable manure will give 5 times the seed; with farmyard manure, 7 times; pigeon dung, 9 times; horse dung, 10 times; human urine, 12, and human excrement, 14 times the seed sown.

*Inorganic Substances found in Plants.*—Silica, alumina, lime, magnesia, potash, soda, oxides of iron, oxides of manganese; these are termed the "bases." The "acids" are as follows:—sulphuric, phosphoric, chlorine, fluorine. In marine plants only iodine and bromine are found.

*Table of the different Substances abstracted from the Soil by different Crops, during a four-course rotation.*—Weights given in lbs. and tenths.[*]

| | | Nitrogen. | Potash. | Soda. | Lime. | Magnesia. | Oxide of iron. | Chloride of sodium | Phosphoric acid. | Sulphuric acid. |
|---|---|---|---|---|---|---|---|---|---|---|
| | Tons. cwts. | | | | | | | | | |
| Wheat | 0 18 | 43 | 11 | 1 | 1 | 4 | 0·2 | — | 15 | ·1 |
| Straw and chaff | 1 13·5 | 13 | 32 | 4 | 12 | 4 | 1·0 | — | 6 | 5 |
| Turnips | 20 0 | 86 | 116 | 4 | 32 | 4 | — | 18 | 32 | 40 |
| Barley | 48 bush<br>2,544 lbs. | 35 | 11·7 | 0·8 | 1 | 4·1 | 1·3 | 2·8 | 21 | 1 |
| Straw | 3,360 lbs. | 8 | 24 | 1·6 | 16 | 5 | 0·3 | 17·8 | 6 | 14 |
| Clover | 2 tons | 79 | 51 | 7 | 110 | 34 | 3 | 8 | 19 | 13 |
| Aftergrass | 1 ton | 39 | 25 | 4 | 55 | 17 | 1 | 4 | 10 | 6 |
| Abstracted by the crops | | 303 | 270·7 | 22·4 | 227 | 72·1 | 6·8 | 50·6 | 109 | 79·1 |

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[*] Mr. W. O. Spooner, in Journal of Bath and West of England Society, vol. viii. part II. p. 406.

*Table of the different Substances supplied to the Land by different Manures, during a four-years' rotation.*[*]

| | | Nitrogen. | Potash. | Soda. | Lime. | Magnesia. | Oxide of iron. | Chloride of sodium. | Phosphoric acid. | Sulphuric acid. |
|---|---|---|---|---|---|---|---|---|---|---|
| Dung (farmyard). | 20 tons | 180 | 140 | 40 | 280 | 20 | 40 | 60 | 140 | 80 |
| Superphosphate...<br>Bone-dust....... | 2 cwt<br>1½ " | 8 | — | — | — | — | — | — | 88 | 36 |
| Turnips fed off, less 10 per cent. loss on the animal's carcase ... | — | 76 | 110 | — | 17 | — | — | 12 | 17 | 18 |
| Clover and after math half fed on land, as grass or hay, less 10 p. ct | 52 | 53 | 34 | 4 | 72 | 22 | 1 | 1 | 6 | 9 |
| Returned to the land..... | | 317 | 280 | 44 | 369 | 42 | 41 | 73 | 251 | 163 |

*Rule to ascertain the quantity of inorganic matter, or mineral food, taken from the soil by the removal of various Crops.*—Take the per centage of the ash of the required crop, reduce the number of tons of the crop removed to lbs., and multiply this by the per centage of ash obtained as above; look at the analysis of the ash of the crop under investigation, then find, by proportion, the amount of the ingredients. Thus, suppose the Jerusalem artichoke is the crop under consideration, the percentage of ash, of which will be found to be 6 lbs. for every 100 lbs. Suppose the weight of the crop to be 10 tons, or 24,400 lbs., the weight of ashes will be equal to 1,464 lbs.; further, suppose that potash is the ingredient of which the amount removed from the soil by the 10 tons is desired to be known. In the analysis of the Jerusalem artichoke, the per centage of potash will be seen to be 55·89, or say 56. Then, by the following proportion, find the amount:—100 lbs. : 56 :: 1,464 : is to the weight of potash removed.

"Every farmer," says the author of the article "Ashes," in Morton's *Cyclopædia of Agriculture*, from which the basis of the above rule has been taken, "who desires to keep his field in a fertile state, should make these calculations for the estimated produce which he removes from it, and then he should restore the abstracted quantity by manure."

*Farmyard Manure replaced by Guano for the Turnip Crop,*—22 lbs. of guano equal to one ton of manure, the estimated quantity in practice; it will be safer to say 1 cwt. for every 2½ tons of farmyard manure.

*Amount of fertilizing Matter in 30 tons of farmyard Manure* (which is a liberal supply per acre for turnips).—Nitrogen, 260 lbs., equivalent to 310 lbs. of ammonia and 450 lbs. of phosphates.

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[*] Mr. W. C. Spooner, in Journal of Bath and West of England Society, vol. viii. part II. p. 406.

*Guano.*—6 cwt. contains 103 lbs. of ammonia and 132 lbs. of phosphates.

*Fertilizing matters* contained in an acre of good soil,—1 to 2 tons of nitrogen and about the same amount of phosphoric acid.

*Mineral Matters removed by Turnips from the Soil.*—Averaging 20 tons to the acre; 340 lbs. will be removed by the roots, 310 by the tops; in all, 650 lbs. of which, according to Johnstone, there is of potash, 231 lbs.; chlorine, 61·99; phosphoric acid, 54·57; soda, 34·07; sulphuric acid, 85·05.

*Table of Synonymous Terms employed in Agricultural Chemistry.*[*]

| *Names.* | *Synonymous Terms.* |
|---|---|
| Bi-phosphate of lime. | Superphosphate of lime, soluble phosphate of lime. |
| Basic phosphate of lime. | Bone phosphate, insoluble phosphate of lime, bone ash, bone earth. |
| Phosphates of lime and magnesia. | Earthy phosphates. |
| Chloride of sodium. | Muriate of soda, common salt. |
| Alkaline salts. | Salts of potash, soda, common salt. |
| Sulphate of lime. | Gypsum, plaster of Paris. |
| Hydrocloric acid. | Muriatic acid, spirits of salt, chlorine. |
| Chloride. | Hydrochlorate, muriate. |
| Silica. | Silicic acid, silex quartz (sand). |
| Sulphuric acid. | Oil of vitriol. |
| Vitriolized bones. | Sulphated bones, dissolved bones, superphosphate of lime. |
| Sulphate of iron. | Copperas, green vitriol. |
| Sal ammoniac. | Chloride of ammonium, muriate of ammonia, hydrochlorate of ammonia. |
| Nitrogenous matter. | Organic substances, containing *nitrogen*, azote, and capable of yielding, by their decomposition, *ammonia* or *nitric acid*. |
| Hydrated. | Containing water in chemical combination. |

To the above we may add, that considerable misunderstanding is created in the reading of analyses, by the employment of the terms "soluble phosphate" and "bi-phosphate." It is well, therefore, to understand that the term "soluble phosphate" is applied to the insoluble phosphate after it has been subjected to the action of the acid. The result of the combination of the phosphoric acid and lime is a new substance, termed the bi-phosphate of lime, of which about 1 lb. is produced from every 1½ lb., or thereabouts, of the soluble phosphate. To the above list we may also add the manure very generally adopted now as a top-dressing for wheat and for grass-lands, namely, nitrate of soda, for which the popular synonymous term is Chili saltpetre.

*Proportion of Ashes in* 100 *lbs. of the Leguminous Crops, as Beans, Peas, Lentils, Vetches.*—Beans, 4·00; peas, 3·00; lentils, 2·06; vetches, 2·40.

*Proportion of Ashes in* 100 *lbs. of the Industrial Plants, as Flax, Hemp.*—Flax-plant, 6·05; linseed, 4·63; hemp-plant, 6·37; hemp-seed, 5·60.

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[*] The (Irish) Agricultural Review, first series, April, 1858.

*Proportion of Ashes in* 100 *lbs. of the bulbs and leaves of Turnips, Beet, Carrots, Potatoes, Jerusalem Artichokes.*—Turnip bulbs, 0·78; turnip tops, 17; mangold, wurzel, or beet bulbs, 0·88; ditto tops, 1·37; carrot roots, 0·91; tops, 4·12; potatoes, 0·76; tops, 14·96; Jerusalem artichokes, 6·00.

*Facts connected with the use of Straw in a Farm,* in the making of manure, &c.—From an interesting and valuable paper in vol. xxi. of the *Journal of the Royal Agricultural Society,* by Mr. Henry Evershed, on "The Proper Office of Straw in a Farm," we cull the following :—

Quantity of rain annually falling in a cattle-yard, 50 feet by 40 feet, at 25 inches per annum, 25,967 gallons, weighing nearly 116 tons; 50 head of stock, in open yards and sheds, require 300 tons of straw as litter in 9 months.

*Manure produced by* 50 *head of Cattle, in six months, in covered yards.*—

| | | |
|---|---|---|
| Voided by the animals | 325 tons | |
| Litter (24 lbs. per head daily) | 100 " | nearly. |
| | 425 | |

The same stock, in open yards, will produce,—

| | |
|---|---|
| Voided by the animals | 325 tons |
| Litter (48 lbs. daily) | 200 |
| Water | — |
| | 525 |

A feeding bullock produces 10 gallons of urine per day; a milch cow considerably less; a sheep, 3 gallons.

*Amount of Dung produced* by the straw of an average yield grown upon an acre is equal to 4 loads; forty cubic feet, or 1½ yards of solid dung, is a substantial load.

## *Cattle Food—Analysis of Feeding Materials—Statements and Calculations referring to Stock.*

### CATTLE FOOD.

Classifying the three kinds of feeding substances, we place them thus :—

1st. Nitrogenous substances, useful in the production of flesh; the bodies of this group are vegetable albumen, vegetable caseine, gluten.

2nd. Non-nitrogenous substances, divided into two classes: first, oily bodies; second, starch, gum, and sugar. The latter three promote and maintain the warmth of the animal; the oily bodies, the fat.

3rd. The mineral substances, the bone-forming portions of food; phosphates, salt and iron alkalies.

These latter substances being abundantly found in all vegetable matter, it is to the qualities of the (flesh-forming) nitrogenous and (warmth and fat-producing) non-nitrogenous substances of food that attention has to be paid.

The nitrogenised portions of food are also known as the *albuminous* and *protein* compounds. The former name is given to them on account of the similarity which exists between vegetable casein, gluten, and legumin, with *albumen*, a substance analogous with the white of eggs. The name *protein* was given by Prof. Mulder, who regarded all albuminous substances as compounds of protein.

The following table, by Professor Tanner,* gives the composition and respective feeding values of the different classes of food:

| MATERIALS. | COMPOSITION. | | | FEEDING VALUE. | |
|---|---|---|---|---|---|
| | Non-nitrogenized matter per cent. | Nitrogenized matter per cent. | Water per cent | As proved. | Per cent. |
| | | | | lbs. | |
| Barley | 56 0 | 13·0 | 14·83 | 6 to 1 | 16·7 |
| Oats | 55·5 | 13 6 | 12·8 | 7 to 1 | 14·3 |
| Beans | 4· 5 | 23 3 | 14 8 | 8 to 1 | 12 5 |
| Peas | 50 0 | 23·3 | 14·1 | 8 to 1 | 12 5 |
| Linseed-cake | 13·52 | 28·56 | 8 6 | 5 or 6 to 1 | 16·7 |
| Linseed-cake and peas equal parts | 31·76 | 25·93 | 11·3 | 4½ to 1 | 22 2 |
| Rape-cake | 11·3 | 33·7 | 6 8 | 6 to 1 | 16·7 |
| Cotton cake | 30·4 | ·42 9 | 7 9 | 6 to 1 | 16·7 |
| Clover-hay | 40 0 | 9·3 | 14 0 | 12 to 1 | 8·3 |
| Swedes | 8 474 | 1 44 | 89·0 | 150 to 1 | 0·66 |
| Mangolds | 8·19 | 1 81 | 86·0 | 150 to 1 | 0·66 |
| Carrots | 10·0 | 1·5 | 85·0 | 160 to 1 | 0 66 |

*Value for Feeding Purposes of various Articles of Food.*†

| MATERIAL. | Cost. | | 100 lbs. contain | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Nitrogen. | | Phosphoric Acid. | | Potash. | | | | |
| | Per ton. | Per 100 lbs. | Oil. | Starch, Sugar, &c. | Oil, Starch, &c., computed as Oil. | Weight. | Value. | Weight. | Value. | Weight. | Value. | Value of Nitrogen, Phosphoric Acid, and Potash. | Deduct Nitrogen for perspiration. | Net Value for Manure. |
| | £. s. d | s. d | lbs. | lbs. | lbs. | lbs | d. | lbs. | d. | lbs | d. | s d | d. | s. d. |
| Meadow-hay | 4 0 0 | 3 7 | 2 68 | 39 75 | 24 63 | 1·46 | 10·62 | 0·90 | 1·35 | 1·50 | 4·50 | 1 4½ | 2 1-12 | 1 2¼ |
| Wheat-straw | 1 15 0 | 1 7 | 0·50 | 32·0 | 18·50 | 0·42 | 3 0 | 0·14 | 0·21 | 0·65 | 2·16 | 0 5 | ½ | 0 5 |
| Swedish Turnips | 4 10 0 | 4 0 | 2 0 | 60 0 | 35 0 | 2 40 | 17 28 | 0·80 | 1·20 | 2 25 | 6 75 | 2 1¼ | 3½ | 1 9¾ |
| Oil-cake | 9 6 8 | 8 4 | 12·0 | 38·0 | 33 0 | 5·0 | 36 0 | 2·25 | 3·37 | 1·75 | 5·25 | 3 8½ | 7¼ | 3 1¾ |
| Beans | 9 6 8 | 8 4 | 2 0 | 42·0 | 25·30 | 4·45 | 32·0 | 0·36 | 1·29 | 1·11 | 3 33 | 3 0½ | 6½ | 2 6 |
| Indian Meal | 9 6 8 | 8 4 | 7 0 | 60 0 | 40·0 | 2·25 | 16 20 | 0·19 | 0 28 | 0·17 | 0 51 | 1 5 | 3¼ | 1 1¾ |
| Carob, or Locust Bean | 9 6 8 | 8 4 | 6·76 | 57·0 | 35.0 | 0·64 | 3·75 | No analysis of ash. | | | | say 5¾ | — | 0 5 |

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* Journal of Bath and West of England Society, vol. vii. part II.

† From Mr. Horsfall's Essay on "Dairy Management," in Journal of Royal Agricultural Society, vol. xviii. part I.

*The following Table gives the cost of* 100 *lbs. of Fat derived from the following Feeding Substances.*[*]

| | Meadow-hay. | Wheat-straw. | Swedish Turnips. | Oil-cake. | Beans. | Indian Meal. | Carob. Beans. |
|---|---|---|---|---|---|---|---|
| | *s. d.* | *s. d* | *s. d.* | *s. d.* | *s. d.* | *s. d.* | *s. d.* |
| Cost of 100 lbs.................................... | 3 7 | 1 7 | 4 0 | 8 4 | 8 4 | 8 4 | 8 4 |
| Deduct net value of Manure........ ................ | 1 2¼ | 0 5 | 1 9¾ | 3 1¾ | 2 6 | 1 1¾ | 0 5 |
| Cost of production of Fat............................ | 2 4¾ | 1 2 | 2 2¼ | 5 2¼ | 5 10 | 7 2¼ | 7 11 |
| Oil and Starch, &c., computed as Oil in lbs.... ... | 24·63 | 18 50 | 35·0 | 33 0 | 25·30 | 40·0 | 35·0 |

*Relative Rank of Feeding Substances.*—The following, arranged from Dr. Fromberg's essay on the potato (*Highland Society's Transactions*, vol. for 1847, p. 637), will show how the several feeding substances rank according to the kind of ingredients to which we look for comparison. Thus, if we wish to ascertain the rank of any substance valued for its protein (flesh-forming) compounds (albumen, casein, and gluten), the number attached will give the rank, the proportion (100 being the standard) being also stated.

*Protein compounds* (albumen, casein, gluten).—1. Beans, 31·4. 2. Peas, 22 6. 3. Oats, 19·65. 4. Wheat, 13·5. 5. Indian corn, 12 3. 6. Rye, 10·5. 7. Rice, 7·5. 8. Barley, 6·0. 9. Potatoes, 5·77. We thus find that, valued for its protein compounds, beans take the highest, wheat the medium, and potatoes the lowest rank.

*Starch.*—1. Rice, 86·9. 2. Wheat, 73·8. 3. Indian corn, 71 2. 4. Barley, 68·7. 5. Oats, 65·27. 6. Potatoes, 64·20. 7. Rye, 64·00. 8. Pease, 52·0. 9. Beans, 44·0. We thus find that for the value of its starch, beans now occupy the lowest place, wheat the second, and rice the first place.

*Gum and saccharine matter.*—1. Potatoes, 15·72. 2. Rye, 15·14. 3. Wheat, 11·7. 4. Barley, 10·3. 5. Peas, 7·7. 6. Oats, 4·49. 7. Beans, 7·3. 8. Rice, 0·5. 9. Indian corn, 0·4.

*Fatty matter.*—1. Indian corn, 9·0. 2. Oats, 6·57. 3. Rye, 3·5. 4. Beans, 2·3. 5. Peas, 2·2. 6. Potatoes, 1·00. 7. Rice, 0·8. 8. Barley, 0 3. 9. Wheat, 3.

*Fibre* or Husk.—1. Barley, 14·7. 2. Potatoes, 13·31. 3. Peas, 12·2. 4. Beans, 11·5. 5. Rye, 8·0. 6. Indian corn, 5·9. 7. Rice, 3·4. 8. Oats, 2·18. 9. Wheat, 1.00. (*Note.*—The fibre, although containing coagulated albumen, is of little or no value for feeding purposes.)

*Beans.*—As compared with other feeding substances, the following are the proportions which beans bear. Wheat, 74 per cent.; rye, 70; barley, 65; oats, 58; beans, 68; peas, 75; French beans, 84.

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[*] From Mr. Horsfall's Essay on "Dairy Management," in Journal of Royal Agricultural Society, vol. xviii. part I.

*Nutritive Value of Cabbage*—The cultivation of cabbage is likely to become more extended, now that its nutritive value is better known. "Indeed," says Dr. Voelcker, "no kind of green food cultivatedon a large scale in the field contains so much nutritious matter as cabbage. Being much more nutritious, weight for weight, than turnips, and at the same time very succulent, cabbages form a valuable food for milch cows. Cattle are very fond of cabbage, and dairy cows fed upon it and some hay, produce much and rich milk, and the butter made from the latter is free from the disagreeable flavor which it always has when the cows are fed upon turnips."* Of water, cabbage contains 86 28 per cent.; of flesh-forming substances, 4·75; of heat and fat-producing substances, 7·10; of inorganic matters (ash), 1·87.

*Composition of Kohl-Rabi as a Feeding Substance.*

| | Green top. | Purple top. |
|---|---|---|
| Water | 86·020 | 89 002 |
| Oil | 0 227 | 0·177 |
| Soluble protein compounds† | 2 056 | 2·006 |
| Sugar, gum, and pectin | 6 007 | 4·486 |
| Salts soluble in water | 0·970 | 0·919 |
| Insoluble protein compound‡ | 0·300 | 0 269 |
| Digestible fibre and insoluble pectinous compounds | 2·293 | 1·896 |
| Woody fibre (cellulose) | 1 230 | 1·106 |
| Insoluble mineral matter | 0·197 | 0·139 |
| | 100·000 | 100·000 |

*Cabbage: Feeding value of.*—16 oz. of the Drumhead cabbage, or 7,000 grains, contain of nutritive matter, 430 grains; woody fibre, 280; water, 6·290. Of nitrogenous or flesh-forming ingredients, the proportion in 100 parts is 1·75; of non-nitrogenous or heat-giving principles, 4·05; of mineral matter, 0·80; of water, 93·40. The quantity of nitrogen is 0·28 per cent., and that of carbon, 8·63 per cent. The proportion is large between the flesh-forming principles and those fitted for the support of respiration. In the potato, the quantity exceeds 20 of the latter to 1 of the former; in the cabbage, it does not reach 3 to 1. Swedish turnips are superior to cabbages in nutritive matter contained in the bulbs, in the proportion of 110 to 107½, and the cabbages are superior to the common white turnip in the proportion of 107½ to 80, and inferior to carrots in the proportion of 107½ to 187. Much depends upon the way in which cabbages are used; for increasing milk and the juicy fluids, cabbages are superior to Swedish turnips, which act more in increasing the fat and the muscular fibre. Where the soil is a rich clayey loam, well manured, and the climate humid, cabbage become a most profitable crop, and afford a large yield. As they do not keep so well as Swedes,

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* Bath and West of England Society's Journal, vol. iv.

| | Green top. | Purple top. |
|---|---|---|
| † Containing nitrogen | 0·329 | 0·321 |
| ‡ " " | 0 048 | 0 143 |
| Per centage of ash | 1·167 | 1·058 |

it is the best way to consume them from October to February. This using them fresh taken up obviates many of the disadvantages arising from the mustiness which they acquire if stored up in masses in the usual way. It is well, however, to store up a goodly proportion of the crop, to serve as food in the spring; that "critical" period, as it has been well termed, when a supply of succulent food is of the utmost importance to the well-being of the stock of the farm.

Opinion is divided as to the best way of giving the cabbages to stock; some holding that they should be cut up like roots, others that the "stools," or heads, should be given to the cattle whole, inasmuch as in addition to the useful exercise of the jaws in tearing them up, the process induces a flow of saliva, which will greatly aid in the digestive process, and in the secretion of the healthy juices.

*Kohl Rabi—Nutritive Value of*

| | Bulbs. | Leaves. |
|---|---|---|
| Water | 86·74 | 86·68 |
| Albuminous compounds | 2·75 | 2·87 |
| Respiratory principles | 8·62 | 8·29 |
| Fibre | 0·77 | 1·21 |
| Ash | 1·12 | 1·45 |
| | 100·00 | 100·00 |
| Nitrogen | 0·44 | 0·38 |

"It is an excellent food for milch cows, inasmuch as it produces much and good milk. The butter made of such milk has a pleasant taste, altogether unlike the disagreeable flavor that characterizes butter made from the milk of cows fed upon turnips."*

*Jerusalem artichoke—Composition of the*

| | Tubers. | Stem. |
|---|---|---|
| Nitrogenous matter | 2·38 | 2·18 |
| Organic matter free from nitrogen | 19·99 | 82·48 |
| Ashes | 1·43 | 2·44 |
| Water | 76·20 | 12·90 |

*Jerusalem artichoke*, value of the root as a flesh-producer, 445 lbs. in ten tons, that being calculated as the produce of an acre.

*Italian rye grass*, fresh cut. 100 parts contain 75·61 of water; flesh-forming elements, 2·45; oil, ·80; heat-forming elements, 14·11; woody fibre, 4.82; mineral matters, 2·21.

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* Dr. Voelcker—Journal of the Royal Agricultural Society, vol. xxi. p. 95.

*Composition of Tussac Grass as a Feeding Substance.*

| | Lower Part. | Upper Part. | | |
|---|---|---|---|---|
| Protein compounds | 2·47 | 4 79 | 17·61 | 19·38 |
| Sugar, gum, and extractive matter, extracted by water | 3·32 | 3·64 | 23·88 | 8·93 |
| Other nutritive substances insoluble in water, but extracted by potash | 1·30 | 3·17 | 9·20 | 18 63 |
| Woody fibre (cellulose, with a little albumen) | 5 68 | 11·86 | 40·88 | 47·94 |
| Saline matter (ash) | 1·14 | 1·37 | 8·23 | 5 12 |
| Water | 86·09 | 75·27 | | |

The third and fourth columns show the composition of the grass dried at 330°, the third column being the lower, the fourth the upper part. Professor Johnstone, who gives this analysis in the *Highland Society's Transactions* for 1848, remarks :—" The first and most striking of the results contained in the third and fourth columns is the large per centage of protein, or muscle-forming ingredients. *These are as great as in the best samples of Wheat, Oats, or Barley,* and show, therefore, that this grass is of a very nutritious quality."

*Composition of Rice-meal as a Feeding Substance, by Dr. Voelcker.*

| | | |
|---|---|---|
| Water | | 12·019 |
| Woody fibre, containing insoluble inorganic matter | 9·83 | 46·500 |
| Starch, gum, and sugar | | 25 524 |
| Protein compounds or flesh-forming substances | | 6 687 |
| Fatty matter | | 5 610 |
| Soluble saline substances | | 3·660 |
| | | 100 000 |

This substance is well adapted for laying on of fat. Oats have twice its feeding value. To pay, if crushed oats sell at £6 6s. to £7 per ton, rice-dust should sell at £3 to £3 5s. Barley-meal may be considered as possessing once as much value as rice-meal.

*The Carob or Locust Bean,* as an article of food for farm stock, is attracting considerable attention. The following, from the *Agricultural Gazette,* is Mr. E. T. Kensington's analysis of it in its natural and dry state.

| | In natural state. | In dry. |
|---|---|---|
| Water | 14 22 | 00·00 |
| Sugar | 54 07 | 63 03 |
| Mucilage and other digestible respiratory principles | 17·41 | 20 30 |
| Woody fibre | 3·88 | 4 52 |
| Oil | 0 96 | 1·12 |
| Protein (compounds) flesh-forming principles | 7 72 | 9 00 |
| Insoluble inorganic matter (insoluble ash) | 0·62 | 0·72 |
| Soluble inorganic matter (soluble ash) | 1·12 | 1·31 |

Containing so large a per centage of sugar, it is valuable for fattening puposes. Its per centage of flesh-formers being small, it is less valuable for young stock and for dairy cows, nitrogenous food for the cattle being the most valuable.

*Feeding Value of Sorghum—(Holcus saccharatus).*—The researches of Professor Voelcker show that the feeding value of this plant is different at different periods of its growth. Thus the part analyzed in September had nearly one per cent. less nitrogen than that cut and analyzed in August. Again, the cattle did not seem to relish it at first, and it was not till the end of September that they began to show a fondness for it. It is right, however, to state that others have found cattle to relish it at a very early period of its growth, and through all its stages. The following, from Professor Voelcker's paper in the *Journal of the Royal Agricultural Society*, vol. xx. p. 381, shows the general composition of the sorghum cut on the 26th of September.

| | In natural state. | In dry. |
|---|---|---|
| Water | 81 80 | ...... |
| Soluble organic matter | 8·16 | 44 83 |
| " mineral matter | 0 74 | 4·07 |
| Insoluble inorganic matter | 9 07 | 49 83 |
| " mineral matter | 0·23 | 1 27 |

The following gives the detailed proximate composition :

| | In natural state. | In dry. |
|---|---|---|
| Water | 81·80 | ...... |
| Albumen * | 0 37 | 2·03 |
| Other soluble protein compounds | 1.16 | 6·36 |
| Sugar | 5·85 | 32.15 |
| Wax and fatty matter | 2·55 | 14 01 |
| Mucilage, pectin, and digestible matter | 2 59 | 14·26 |
| Soluble mineral matter | 0·74 | 4·06 |
| Insoluble protein compounds† | 0·66 | 3·62 |
| Indigestible woody fibre (cellular) | 4 05 | 22 25 |
| Insoluble mineral matter | 0 23 | 1·26 |
| | 100 00 | 100·00 |

While drawing attention to the fact that the sorghum cut in September had one per cent. less of nitrogen than that cut in August: while of sugar, that cut in August had no "appreciable quantity," that in September having 6 per cent. Professor Voelcker has the following: "We have here presented to us a fresh

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| | In natural state. | In dry. |
|---|---|---|
| * Containing nitrogen | ·242 | 1·34 |
| † " " | ·106 | 0·58 |
| Total quantity of nitrogen | ·351 | 1·92 |

proof that the nutritive value of food of the same kind is not regulated by the amount of nitrogen which it contains, but rather by the proportion of sugar. Indeed I think it may be asserted that all green food, and likewise turnips and other roots are immature, and more or less unfit for feeding, when they are rich in nitrogen. Fully ripe and very nutritious roots and grass always contain less nitrogen than the same food in an immature state, or than food of indifferent feeding qualities."

*Nutritive Value of the Lupine.*—"The following is the result of an analysis of the air-dried seeds:

| | Per cent. |
|---|---|
| Water | 14—15 |
| Nitrogenous substances | 33—36 |
| Fatty matter | 6— 7 |
| Starch, sugar, &c. | 26—30 |
| Woody fibre | 11—12 |
| Mineral matter | 3— 4 |

We learn from this analysis that the lupine seeds contain a greater per centage of nitrogenous substances than any other of our leguminous plants; so that their high value is fully confirmed by science."

*Distillery Wash or Dreg as a Feeding Substance.*—This, in many districts, is extensively used as food for cows. Dr. Anderson has given three analyses of samples obtained from a distillery near Edinburgh, of which No. 1, here given, was stated to be a "fair specimen of the refuse of the work." If so, "it ought," says Dr. Anderson, "to be of great importance in feeding cattle, as it contains about as much nutritive matter, as are found in two-thirds of its weight of turnips; or 15 gallons of dregs shall be equal in value to 100 lbs. of turnips."

An imperial gallon of the ash or dreg contained organic matter—

| | Grains. |
|---|---|
| Organic matter | 4127·9 |
| Ash | 276·1 |
| Total Solids | 4404·1 |

The 276·1 grains of ash contained—

| | Grains. |
|---|---|
| Earthy phosphates | 73·7 |
| Phosphoric acid in combination with alkalies | 61·0 |
| Potash | 34·4 |
| Soda | 52·3 |
| Sulphuric acid, chlorine, &c. | 54·7 |

Quantity of nitrogen in the organic matter, 243 grains.

*Green Oats as Food for Cattle.*—"A very material saving," says Mr. Walker, "is effected by cutting the oats intended for live stock while the straw is yet green, the ear being nevertheless fully formed, though still milky, or nearly so.

. . . . . Oats thus reaped and cut into chaff, half-inch to inch length, will go one-fourth further than the same allowed to ripen and used as in this country." Dr. Voelcker published, in 1850, in the *Journal of Agriculture*, p. 250, a valuable paper on oat-hay (oats cut green and used like hay), and the relative nutritive value of oats cut green, and cut fully ripe. The following is a *resumé* of the conclusions arrived at from the experiments made. Apart from other advantages "which are in favor of oat-hay, the relative portion of really nutritive matters in equal quantities of oats cut green, and oats fully ripe, is larger in the former than in the latter. I say apart from all other advantages. . . . . But I will only add a few remarks before I conclude, to the very important one referring to the superiority of manure. It is not only the better appearance of the manure-heap, which speaks in favor of the use of oat-hay, but the fact itself is a sure indication how thoroughly the food has been digested in the stomach of the animal. The reason oat-hay is more readily and completely digested than fully ripe oats is obvious." "Oat-hay, or oats cut green, contains a larger proportion of soluble substances readily digestible, but which become insoluble, and less readily digestible when allowed to ripen. Animals fed upon young shoots of vegetables which are soft and eatable, thrive well, but can scarcely maintain themselves upon matured food, which becomes woody and indigestible, and passes through the intestines in a great measure unchanged." The reason of this difference is, that the starch, gum, sugar, and other soluble and readily digestible substances, which we find in the young shoots of vegetables and roots, are partly rendered insoluble, and gradually changed into indigestible woody fibre, which substance increases with the age of the plant."

*Comparative Value of the Potatoe as Food, compared with Oats, Wheat, Indian Corn, Rye, Barley, Rice, Peas and Beans.*

| | Potato. | Wheat. Boussin. | Oats. Norton. | | Rye. Boussin. | Barley. Hermbst. | Rice. Payen. | Ind. Corn. Payen. | Peas. Boussin. | Beans. Boussin. |
|---|---|---|---|---|---|---|---|---|---|---|
| Starch | 64.20 | 73·8 | | 65·27 | 64 00 | 68·7 | 86 9 | 71·2 | 52 0 | 44·0 |
| Dextrine | 2·25 | 4 7 | | 2·24 | 11·00 | 5 0 | 0·5 | 0 4 | 5 5 | 5 0 |
| Saccharine matter | 13·47 | 7·0 | | 2·25 | 3·00 | 5·3 | | | 2·2 | 2·3 |
| Albumen | 5·77 | 13·5 | 19·65 | 1·42 | 10·5 | 6·0 | 7·5 | 12·3 | 22 6 | 31·4 |
| Casein | | | | 16·55 | | | | | | |
| Gluten | | | | 1·68 | | | | | | |
| Fatty matter | 1 00 | .. | | 6 57 | 3·5 | 0 3 | 0·8 | 9·0 | 2·2 | 2 3 |
| Fibre or Husk | 13 31 | 1·00 | | 2·18 | 8·0 | 14·7 | 3·4 | 5·9 | 12·2 | 11·5 |
| Salts, and loss | .. | .. | | 1·84 | .. | .. | 0·9 | 1·2 | 3·3 | 3·5 |

"Looking at these tables as a whole, and comparing that of potatoes with each of the others in a general point of view, I would feel inclined to propose the following arrangement:

| | |
|---|---|
| Beans | 100 |
| Peas | 80 |
| Oats | 75 |

| | |
|---|---|
| Wheat | 70 |
| Indian corn | 60 |
| Rye | 55 |
| Barley | 50 |
| Potatoes | 45 |
| Rice | 35 |

This means that the general feeding properties of peas are to those of beans as in nearly the same ratio as 80 to 100. It is evident that such a valuation can only be approximative, for the composition of these esculents just given is by no means constant."*

Much of the following matter, down to the paragraph on the "Nutritive Value of Straws," is compiled from Dr. Voelcker' paper on the "Chemistry of Food," in the *Journal of the Bath and West of England Society*, vol. iv. new series, p. 190.

*Nutritive Value of Peas, Beans, Lentils.*

| | Peas. | Field-beans. | Lentils. |
|---|---|---|---|
| Nitrogenized or flesh-forming constituents | 23·4 | 23·3 | 24·0 |
| Substances free from nitrogen fitted to support respiration, and to lay on fat: | | | |
| *a* Starch, sugar, fat, &c. | 50·0 | 48·5 | 52·0 |
| *b* Woody fibre | 10·0 | 10·0 | 9·0 |
| Ash (bone materials) | 2·5 | 3·4 | 2·5 |
| Water | 14·1 | 14·8 | 12·5 |

The value of the leguminous seeds (as beans, peas, lentils, tares), as feeding substances, is nearly identical. The characteristic constituent is legumen, which, approaching so closely the cheesy matter of milk, has been named "vegetable casein." For purely flesh-producing purposes, leguminous seeds are as valuable as oil-cakes, but, deficient in oil, they are inferior for fattening purposes. Oil-cakes possess both peculiarities of fattening stuffs necessary to insure success. Mixed with bulky food, as roots, hay, or chaff, the leguminous seeds are valuable as food; but their binding or costive nature precludes their being used too frequently or to too great an extent. Being, however, rich in muscle-producing matter, they are peculiarly valuable for feeding horses.

*Nutritive Value of the Cereals, Wheat, Oats, Barley, Indian Corn.*

| | Wheat. | Oats. | Barley. | Indian Corn. |
|---|---|---|---|---|
| Water | 12.26 | 13.09 | 14 65 | 14.96 |
| Flesh-forming constituents | 11.64 | 11.85 | 10.84 | 11.27 |
| Heat and fat producing substances | 68 74 | 63.34 | 68.81 | 67.48 |
| Woody indigestible fibre | 2.61 | 9.00 | 3 45 | 5.02 |
| Inorganic matters (ash) | 1.75 | 2.72 | 2.75 | 1.27 |

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* Dr. Fromberg on the Potato, in the Highland Society's Transactions, vol. for 1847, p. 670.

The woody fibre is pretty constant in amount in the different varieties of wheat, but very considerable differences are found to exist in barley, and especially in oats. This difference of the amount of woody fibre is perhaps the key to the conflicting statements often made as to the comparative feeding value of barley and oats. Oats, for instance, grown in England, are not so free from this fibre as oats grown in Scotland, while the same may be said of barley grown in Scotland, as compared to that grown in England.

The cereals are valuable as containing a large amount of fat-producing substances. Indian corn is peculiarly valuable in this respect.

*Nutritive Value of the Refuse of Grain, Bran, &c.*

| | Bran. | Malt-dust. | Oat-dust. | Brose Meal Brook. | Pea Hulls from Maple Peas. | Barley-dust. | Rice dust. |
|---|---|---|---|---|---|---|---|
| Water | 12.86 | 6.24 | 9.31 | 9.12 | 10.12 | 11.03 | 12.02 |
| Flesh forming constituents | 13.80 | 25.62 | 6.92 | 10.66 | 5.64 | 8.46 | 6.69 |
| Oil | 5.56 | 59.44 | 3.21 | 1.65 | 0.66 | 3.47 | 5.61 |
| Woody fibre | 11.50 | | 72.86 | 75.08 | 80.21 | 69.73 | 36.67 |
| Starch, gum, &c. | 50 17 | | | | | | 25.52 |
| Inorganic matters (ash) | 6.11 | 8.70 | 7.70 | 3.49 | 3.37 | 7.31 | 13.49 |

The nutritive value of the above substances varies very much; the most valuable are bran, rice-dust, and oat-dust. Of bran, it is noteworthy that it contains a larger amount of fatty matters and flesh-forming constituents than the whole grain of wheat. Rice-dust contains a larger amount of ready-made fatty substances, and is therefore valuable for fattening purposes.

*Nutritive Value of Roots.*—The value of the different varieties of roots as feeding substances may be gathered with tolerable accuracy from the quantity of water they contain. According to this simple rule, potatoes stand highest, parsnips second, carrots third, mangolds fourth, swedes fifth, and turnips lowest in feeding value. The analysis of the potato as a feeding substance we have already given; of the others as follows:

| | Parsnips in fresh or natural state. | White Belgium Carrots ditto. |
|---|---|---|
| Water | 82 050 | 87.338 |
| Nitrogenized organic substances capable of producing flesh | 1.280 | 0.667 |
| Substances not containing nitrogen, fitted for the support of animal heat and the formation of fat | 15 738 | 11.250 |
| Inorganic substances (ash) | 0.932 | 0.745 |

### *Nutritive Value of Mangold.*

| | In natural state. |
|---|---|
| Water | 87.78 |
| Flesh-forming constituents | 1 54 |
| Woody fibre | 1.12 |
| Sugar | 6 10 |
| Pectin, gum | 2 50 |
| Inorganic matters (ash) | 0.96 |

Mangolds should not be given to animals before the end of December or the beginning of January. The roots are found, when fresh taken up, to contain an acrid substance, tending to scour the animals which partake of it. The pectin, too, in old roots, is found to change into sugar. It is worthy of notice that experiments have shown that mangolds are nearly worthless as fattening food for sheep.

*Nutritive Value of Turnips and Swedes.*—On account of the variations observable in one and the same species of turnips, it is difficult to fix precisely the nutritive value of these roots. The following average analyses must, therefore, be regarded simply as illustrations of the proximate composition of some kinds of turnips:

| | ANALYZED BY DR. VOELCKER. | | | ANALYZED BY DR. ANDERSON. | |
|---|---|---|---|---|---|
| | White Globe. | Norfolk Bell. | Swedish Turnip. | Purple top Yellows | Aberdeen Yellows. |
| Water | 90.430 | 92.280 | 89.460 | 91.200 | 90 578 |
| Flesh-forming substances | 1.143 | 1.737 | 1 443 | 1.117 | 1 802 |
| Fatty matters | not determined. | | | 0.103 | 0·441 |
| Sugar, pectin, gum, &c. | 5.457 | 2.962 | 5.932 | 4.333 | 4.181 |
| Woody fibre | 2.342 | 2.100 | 2.542 | 2 607 | 2.349 |
| Inorganic matters (ash) | 0.628 | 1.021 | 0.623 | 0 640 | 0.649 |

In comparing the nutritive value of roots, many points should be taken into consideration. Roots grown quickly, under the stimulus of artificial manures, are considered to be less nutritious than those grown more naturally and slowly. It is also a question how far the use of guano reduces the nutritive value of roots grown with its aid. Soil also influences greatly the nutritive value of roots; those grown in a peaty or a stiff clay soil are not so good as those raised on "good turnip loam."

*Nutritive Value of Hay, of various Grasses, containing* 14.3 *per cent.* (*the average*) *of Water.*

| Botanical Designation. | English Name. | Flesh forming Matters. | Fat. | Respiratory Principles. | Woody Fibre. | Ash. |
|---|---|---|---|---|---|---|
| Anthoxanthum odoratum.. | Sweet-scented vernal grass.... | 8.94 | 2.92 | 37.27 | 31.17 | 5.42 |
| Alopecurus pratensis..... | Meadow fox-tail grass........ | 10.56 | 2 50 | 36 96 | 29.00 | 6.69 |
| Arrhenetherum avenaceum. | Common oat-like grass........ | 11.10 | 2.73 | 32.60 | 29.35 | 9.93 |
| Avena flavescens........ | Yellow oat-like grass......... | 6.41 | 2 24 | 40.35 | 30 81 | 5.90 |
| " pubescens........ | Downy oat-grass............. | 6.83 | 2.05 | 42.67 | 29.69 | 4.47 |
| Briza media............. | Common quaking grass....... | 5.21 | 2.58 | 40.24 | 30.26 | 7.42 |
| Bromus erectus.......... | Upright brome grass......... | 8.09 | 2.85 | 70.30 | | 4.47 |
| " molis............ | Soft brome grass............ | 14 82 | 1.81 | 33.14 | 30.96 | 4.99 |
| Cynosurus cristatus...... | Crested dog-tail grass........ | 9.51 | 2.83 | 45.12 | 22.59 | 5.47 |
| Phleum pratense......... | Meadow cat's-tail grass....... | 9.74 | 3 04 | 45.73 | 22.68 | 4.53 |
| Dactylis glomerata....... | Cock's-foot grass............ | 11.60 | 2 69 | 37.99 | 28.89 | 4.55 |
| " seeds ripe....... | " " ............ | 19.78 | 1.34 | 22.74 | 37.13 | 4.72 |
| Festuca duriuscula....... | Hard fescue grass............ | 10.37 | 2.86 | 34.65 | 33.18 | 4.65 |
| Holcus lanatus.... ...... | Soft meadow grass........... | 9.87 | 3.05 | 33.64 | 33.69 | 5 46 |
| Hordeum pratense........ | Meadow barley.............. | 9.57 | 1.97 | 40.01 | 27.15 | 5.30 |
| Lolium perenne.......... | Darnel grass................ | 10.16 | 2.72 | 36.21 | 30.17 | 6.46 |
| " italicum......... | Italian rye.................. | 8.66 | 2.80 | 49.56 | 16 94 | 7 76 |
| Poa annua.............. | Annual meadow.............. | 10.14 | 2.93 | 44.30 | 25.90 | 2.43 |
| " pratensis........... | Smooth-stalked meadow grass. | 8.87 | 2.25 | 36.88 | 32·59 | 5.09 |
| " trivialis............ | Rough-stalked meadow grass.. | 8.40 | 3.15 | 34.43 | 32.60 | 7.14 |
| Grass from water meadow. | | 22.21 | 5.60 | 27.47 | 21.55 | 9.03 |
| Ditto, second crop........ | | 9.36 | 1.77 | 37.63 | 29 40 | 7.56 |

It is to be noted that natural and artificial grasses are more nutritious when young than when at the period of full flower.

*Nutritive Value of the Artificial Grasses.*

| | Red Clover. | White Clover. | Yellow Clover. | Alsike Clover. | Bokhara Clover. | Lucerne. | Sainfoin. | Vetch. | Plantain. |
|---|---|---|---|---|---|---|---|---|---|
| | IN THE NATURAL STATE. | | | | | | | | |
| Water.................................. | 80.64 | 83.65 | 77.57 | 76.67 | 81.30 | 73.41 | 77.320 | 82.16 | 80.79 |
| Flesh-forming substances............... | 3.6 | 4.52 | 4 48 | 4.82 | 3.28 | 4.40 | 3.512 | 3.56 | 2.48 |
| Heat and fat producing substances....... | 13.78 | 10.26 | 15.94 | 16.44 | 13.52 | 19.11 | 17.43 | 12 74 | 14.89 |
| Inorganic matters (ash)................ | 1.9 | 1.57 | 2.00 | 2.06 | 1.89 | 3 08 | 1.73 | 1.54 | 1.83 |
| | IN THE DRY STATE. | | | | | | | | |
| Flesh-forming substances............... | 18.64 | 28 31 | 20.00 | 20.69 | 17.56 | 16.56 | 15 50 | 20.00 | 12.94 |
| Heat and fat producing substances....... | 71.17 | 62.09 | 71.09 | 7 .49 | 72.33 | 71.86 | 76 87 | 71.37 | 77 55 |
| Inorganic substances (ash).............. | 10.19 | 9.60 | 8 91 | [illegible] 82 | 10.11 | 11 58 | 7.63 | 8.63 | 9.51 |

Artificial grasses, although containing more water, yet give a larger amount of flesh-forming substances than the natural grasses. Soil, and period of cutting down, exercise a material influence, doubtless, on the nutritive value of the grasses.

*Nutritive Value of Green Rye and Rape.*—These substances, more especially the latter, are now being much introduced as spring feed. Rape is of higher value in this way than rye. It is rich in flesh-forming as well as in fatty constituents; indeed, in the latter it is richer than any other green food. Rape, to yield the highest value, should be grown upon good soil; and with attention to its cultivation, it will afford a greater and a richer yield than turnips. Rye appears to be of inferior feeding value; indeed, less so than the better classes of clover.

| | Green Rye in natural state. | Green Rape in natural state. |
|---|---|---|
| Water | 75.423 | 87.050 |
| Nitrogenized substances, flesh-forming constituents | 2.705 | 3.133 |
| Non-nitrogenized matter: | | |
| *a*. Woody fibre | 10.488 | 3.560 |
| *b*. Fatty matter | 0.892 | 0.649 |
| *c*. Respiratory substances | 9.134 | 4.000 |
| Inorganic matters (ash) | 1.358 | 1.608 |

*Nutritive Value of Clover Hay, according to Dr. Anderson.*

| | |
|---|---|
| Moisture | 16.84 |
| Flesh-forming substances | 13.52 |
| Non-nitrogenized substances | 64.43 |
| Mineral matters (ash) | 5.51 |

*Nutritive Value of Meadow Hay.*—The following is a mean of twenty-five analyses of common meadow hay: Water, 14.61; flesh-forming constituents, 8.44; respiratory and fatty matters, 43.63; woody fibre, 27.16; mineral matters (ash), 6.16. Dr. Wolff's analysis, as follows, may represent hay of superior value, and Dr. Anderson's of inferior. Wolff's—Water, 16.94. Anderson's—Water, 16.54; nitrogenized substances, 10.69—6.16; non-nitrogenous substances, 40.17—69.89; mineral matters (ash), 5.04.

*Nutritive Value of Aftermath.*—Water, 13.06; flesh-forming matters, 10.75; respiratory and fatty matters, 49.74; woody fibre, 19.02; mineral matters (ash), 7.46. It is a general belief that aftermath is not so valuable as the first crop of hay; the truth of this, to say the least, is doubtful. When the aftermath is cut early, and well got in, experiments show that it possesses a higher nutritive value than the first-got hay.

*Nutritive Value of the Straws.*

| | Wheat. | Rye. | Barley. | Oats. | Common Scotch Bean | Winter Bean. | Peas. |
|---|---|---|---|---|---|---|---|
| Water......... ........................ | 14 23 | 14·30 | 14·30 | 12·06 | 19 23 | 20·9 | 12·00 |
| Flesh-forming matters.................... | 1·79 | 2·29 | 1·68 | 1·63 | 8·25 | 6·79 | 12·55 |
| Respiratory and fatty matters............. | 31·06 | 37·15 | 39·98 | 37·86 | 65·85 | 65 96 | 21·93 |
| Woody fibre................. ........... | 45·45 | 43 18 | 39·80 | 43·60 | ...... | ...... | 47·52 |
| Mineral matters (ash)....... ............. | 7·47 | 3.08 | 4 24 | 4·85 | 6 67 | 6·35 | 6·00 |

Straw, as a feeding material, is useful chiefly as supplying the bulk necessary in feeding materials; it possesses little flesh-forming matter, and a large amount of indigestible woody fibre.

The above paragraphs, comprising the nutritive values of beans, peas, down to the straws in last paragraph, give the reader but a very brief *resumé* of the leading features of Dr. Voelcker's able paper, to which we have formerly referred as published in the *Journal of the Bath and West of England Society.* Space has prevented us from even glancing at the many important points discussed therein, and for which we have only to refer the reader to the paper itself. It abounds in matter of a highly-suggestive kind.

*Oil-cakes.*—Of all the various feeding materials, oil-cakes are, perhaps, the most valuable, at least no other foods possess the great advantages of combining the rapid production of butcher's meat with that of the most fertilizing constituents. Oil-cakes are at once rich in oil (heat-supporting, fat-producing), in nitrogenous substances (flesh-forming), and in bone material. "These," says Dr. Voelcker, are "characteristics that confer a particular value upon oil-cake, either directly as food, or indirectly as useful material for increasing the value of farm-yard manure. For let me observe, that oily matters and substances that make butchers' meat are the most valuable constituents in all feeding materials, and therefore also in oil-cake. On the other hand, the flesh-forming constituents, and the bone-forming materials—in other words, the nitrogen and the phosphates of the cake—are the two most valuable fertilizing constituents. We have thus in oil cakes in a concentrated state, materials that produce butchers' meat, and at the same time yield the most valuable fertilizing constituents. There is no other description of food which unites these useful properties."

Oil cakes are of three classes, principally linseed cake—known *par excellence* as oil-cake, rape-cake, and cotton-seed cake." Oil-cakes are formed of the residue left after the expression of oil from the seed. They are subject to great and frequent adulteration, so much so that it is difficult to get good oil-cakes free from admixture with foreign, and too often deleterious, substances.

For various other points connected with oil-cakes we refer the reader to the able lecture of Dr. Voelcker, read before the Royal Agricultural Society of England, 1860 (of this a *resume* will be found in the *Year Book of Agricultural Facts* *for* 1860), and from which we have extracted the above paragraph and the following analyses :—

### *Composition of Linseed and of Oilcakes.*

| | Linseed. | Linseed-cake. | Rape-cake | Mustard cake. | Cotton seed-cake made of whole seed. | Poppy-seed-cake. |
|---|---|---|---|---|---|---|
| Water | 7·50 | 12·44 | 10·68 | 11 90 | 11·19 | 11·63 |
| Oil | 34·00 | 12·79 | 11·10 | 6 69 | 9·08 | 5 75 |
| Flesh-forming matters | 24·44 | 27·69 | 29·53 | 23·48 | 25 16 | 31·46 |
| Heat giving constituents | 30 73 | 40 95 | 40·90 | 52·14 | 48 93 | 38·18 |
| Inorganic matters (ash) | 3·33 | 6 13 | 7 79 | 5·79 | 5 64 | 12 98 |
| | 100·00 | 100 00 | 100 00 | 100 00 | 100 00 | 100·00 |

### *Composition of Linseed-cake.*

| | English. | American. |
|---|---|---|
| Water | 13.20 | 11.64 |
| Oil | 10 30 | 10.43 |
| Woody fibre | 12.90 | 14 26 |
| Albuminous compounds (flesh-forming substances) | 29.75 | 24.01 |
| Mucilage, gum, etc , (respiratory compounds) | 28.23 | 34.44 |
| Ash | 5.52 | 5.22 |
| | 100 00 | 100.00 |
| Containing phosphate of lime and magnesia (bone earth) | 2.78 | 2 90 |
| Alkaline salts | 1.86 | 1.90 |
| Sand and soluble silica | .98 | 0.42 |

### *Composition of Cotton-seed Cake.*

| | COTTON SEED CAKE. | | Bean-meal. | Bran. |
|---|---|---|---|---|
| | Decorticated. | Whole seeds. | | |
| Water | 8.29 | 11.34 | 14 80 | 12.86 |
| Oil | 16.05 | 6.18 | | 5.56 |
| Albuminous compounds* (flesh-forming matters) | 41.25 | 23.72 | 23.30 | 13.80 |
| Gum, mucilage, sugar, etc., (heat-producing substances) | 17.44 | 30.98 | 48 50 | 50.17 |
| Woody fibre | 8.92 | 21.24 | 10.0 | 11.50 |
| Mineral matter (ash) | 8.05 | 6.54 | 3.4 | 6.11 |
| | 100.00 | 100.00 | 100.00 | 100.00 |
| *Containing nitrogen | 6.58 | 3.79 | 3 73 | 2 20 |

While on the subject of cattle food, we must advert, though briefly, to those manufactured "foods" which have been placed with great persistence before the agricultural public as economical in the highest degree. On these we quote from the *Irish Farmer's Gazette*:—

Mr. Lawes was the first to show, by a series of carefully made analyses, the true nature of these made-up kinds of food; and he has since been corroborated by Drs. Anderson and Voelcker, and latterly by Dr. Cameron, of Dublin. Those gentlemen have proved that the prices charged for such food are very much greater than their intrinsic properties would warrant, purchasers paying from £40 to £50 per ton for a material which is not worth more than £7 or £8. Professor Voelcker's report to the Council of the Royal Agricultural Society of England is very strongly condemnatory of such preparations He says:—

"'Most samples of cattle food which I have hitherto examined contain large proportions of rice meal (the refuse of rice dressing mills), oat dust, and the sweepings of flour mills, mixed with spoiled and inferior flour. The bad taste and fusty smell of the latter are concealed by strong-smelling drugs, such as fenugric, or anise or fennel seed, and also by bitter substances, such as gentian. In one particular sample, much recommended as food for pigs, I have found the bulk of the meal to consist of crushed carrots, beans, rice, and barley-meal; this food also contained some sulphur and nitre, as well as fenugric, and a little aniseed; it was, in fact, a regular medical powder.'

"We would, therefore, recommend all parties to use only such articles as they really know the value of, or which will bear the test of examination; for while such preparations as those to which we refer do possess a certain amount of value, it has not, hitherto, been at all equivalent to the cost."

*Points to be considered in determining the Value of a Food*—We have already shown the peculiar classes of constituents which give nutritive value to foods, and the necessity there is for these being represented in each, for on their presence depends their total nutritive effect. This, however, in addition to the presence of these constituents, is also dependent upon a variety of circumstances, of importance to be noted. What these are has been well stated and fully explained by Professor Voelcker, in his able paper on the *Chemistrg of Food*, of which we have so freely availed ourselves. Space does not permit of our giving these *in extenso*; we can but give a *resume* of them, and that of the briefest kind.

In estimating the practical value of a food, the following must be taken into consideration:—

1. *The age of the animal.*—For young animals, food rich in nitrogenized and poor in woody fibrous matter is required; bone-forming materials are also required.

2. *The various kinds of animals.*—The food fitted for horses is not the best for cows and sheep.

3. *The natural disposition or temper of the animals.*—While a short-horn fattens rapidly, a Kerry or a Welsh cow rarely fattens.

4. *The purposes for which animals are kept.*—The difference between fattening

store cattle and keeping milch cows in good con
horses working hard in spring and summer a
which will fatten them easy in the stable in win

Again, although we may reason with some d
analyses as to the feeding properties of food, i
these may be greatly modified by the way in w
the animal organism of the animal fed upon the
of attending to the digestibility of food. Unfo
known about this important process, so that not
tainty about it. But a few of the conditions c
depends, are stated by Dr. Voelcker, of which

1. *On the kinds of animals.*—Thus cows mor
in cut straw than horses; while sheep do not so

2. *On the amount and character of woody fib*
woody fibre is less easily digested than other co
also affects the nutritive value of food in whic
plants is readily transformed into fattening sub
old or fully ripened plants passes almost entirely

3. *On the amount of flesh-forming substances.*
given sparingly to cattle; while for horses subj
is well adapted.

4. *On the bulk of the food.*—The bulk of food
of the digestive organs; the bulk is, however, su
the animal; thus, horses require less bulk than c

5. *On the form in which food is presented to the*
possesses little value, by preparing it in another i
into chaff is better than the straw in bulk; stean
better still. Oats and barley, beans, and oil-c
worth by being bruised. The steaming of hay
them also more readily assimilable by the animal
consequently more palatable.

6. *On small proportions of substances with whic*
The researches of Professor Liebig on the juices
of certain substances greatly influencing its diges
pounds which play an important part in the diges
amount, and if the digestibility is influenced by sr
as Liebig discovered,—"is it not likely," asks Dr.
may contain small quantities of compounds which

But further, the economical value of food is inf

1. *By prejudicial substances which food may*
although rich in feeding constituents, from the qu
essential oil of mustard which it contains, cannot

2. *By the mechanical effect of the food* exercise

bran; which, though highly nutritious, cannot be largely employed as food, from the rapidly relaxing effect it has upon the digestive organs.

3. *By the physical condition of the food.*—Musty food, for instance, is prejudicial.

4. *By the flavor which it imparts to the meat or milk.*—While a food may be highly nutritious, it may, by giving a peculiar and unwished for flavor, be put quite out of the pale of usuable food.

"These remarks, and others which will suggest themselves to practical men, show that the chemical composition of food alone cannot determine its chemical value; but that a variety of cicumstances have to be taken into account before we can arrive at anything like a correct view of the nutritive value of a feeding material."

"*Points which indicate Strength of Constitution, combined with a Disposition for Fattening.*"—According to Professor Tanner (in the "Prize Essay on Cattle," *Journal of Bath and West of England Society*, vol. vi. new series, p. 216), "the head should be rather small in proportion to the animal, and well set on the neck; with a fine tapering muzzle; a broad forehead; a bright, full, yet placid eye; urnished with graceful, well-turned horns, of fine quality; and ears small and fine.

"The neck should be thick, not too short, but having a graceful appearance, by tapering steadily towards the head, and yet not getting thin behind the ears.

"The shoulder should lie snugly in the carcass; it should be covered with a well developed muscle down to the knee, below which it should possess a fine and flat bony support.

"The chest should be bold and prominent, wide and deep, furnished with a deep, but not a coarse dewlap.

"The carcass should be barrel shaped, having a level and broad top, especially across the hips; the ribs should be well rounded; the space between the last rib and hips should not be too short, yet at the same time we must guard against too great length; although there will be little ground for objection, provided the rib is well rounded, and the loin flat; and this will add weight to the animal in a good part. The flank should be full and pendant.

"The hind legs should be full and fleshy down to the hock, with a well-developed buttock, showing great substance; but below the hock we require a fine and clearly-formed bone.

"The tail should be finely formed, without much hair.

"The hide mellow to the touch, covered with a fine, yet plentiful coat of hair.

"Animals thus developed in all their points, will be alike gratifying to the eye of the connoisseur and profitable to the grazier. Here we have well-developed muscle, with a disposition for fattening, and the offal of the body reduced to a minimum point."

*Points indicating a good Milking character in Milch Cows.*—"The most prominent of these are the vessels which co-operate in the production of milk. These consist of the vessels which bring the blood, the glands which separate the milk, and the veins which carry away the blood when thus acted on. Of the former I may name those veins which show themselves between the bearing (*vulva*) and the udder. These are often buried so that they cannot be seen, and although on pressure, immediately above the udder, they frequently appear, yet we must not immediately condemn the animal as a bad milker when they cannot be observed.

Generally, if the skin is mellow, and not much of fat present, these veins show themselves readily. Their presence is very desirable; and, combined with a full development upon the surface of the udder, they indicate a free supply of blood to the milk glands. It is also considered a good point when these veins present a knotty appearance.

The milk glands are situated in the upper portion of the udder, and are generally four in number, each gland being in connection with its own quarter of the udder. The udder should be capacious, extending well behind the legs, and also forward under the belly; the coat should be thin, with a soft skin, and show considerable decrease in size after the cow is milked. The teats, which are the channels from the four reservoirs in the udder, should be placed well apart from each other, and not cramped together, for this generally indicates a want of sympathy in one udder. The udder may appear large, and yet be found fleshy rather than capacious. After the blood has been acted on by the glands, it is conveyed away by the veins, but none of these can be seen externally. The milk vein, which runs along the side of the belly, has been called so from its supposed connection with the udder; but such is not the case. Especial attention is desirable to the mellowness of the skin, and more particularly if the animal is poor. This vein is a sure indication of the quality of the blood supplied, and for all practical purposes may be taken as a guide.

Some attention has also been given within a few years to a discovery made by Mons. Guenon respecting the *escutcheon*, as it is termed. * * * It can scarcely have escaped the reader's notice, that the hair on the buttocks of cattle grows in two different directions, one portion pointing upwards, and another part downwards, and thus producing a sort of fringe at the point of juncture. This hair, which has an upward tendency, has been termed the "escutcheon." A very extended observation has proved that, *other conditions being equal*, the modification of form presented by the escutcheon will lead to an estimation, not of the *quantity* of milk which the animal will produce, but also of *the time* during which the cow will *keep up the supply of* milk. Without going much into detail on this point, I may briefly state that the larger the extent of the escutcheon, the greater is the promise of milk, and also of the continuance, even after the cow is again in calf. A cow may have a small escutcheon, and yet be a good milker; but observation leads to the conclusion, that if she possessed a more fully developed escutcheon, she would have been a better milker. It may be considered a point of merit, not as *deciding* whether or not the cow is a good milker, but rather as an additional indication, which may be taken into consideration in conjunction with other characteristic points. It is also desirable, in estimating the extent of the escutcheon, to make full allowance for the folds in the skin, otherwise a large escutcheon may be taken for a small one. Besides the escutcheon, there are tufts of hair (*epis*) which have a certain degree of value, when seen upon the udder of a cow.*

*Mr. Horsfall's Dairy Management.*—Mr. Horsfall, in his Prize Essay in the *Journal of the Royal Agricultural Society of England*, vol. xvii. p. 261, gives the following statement respecting his mode of management. It is to be noted that Mr. Horsfall has two great objects in view in carrying out his plan—the maintaining the supply of rich milk for butter-making, and the fattening of the animal. Under ordinary circumstances cows lose in condition while giving *milk;* the elements of food which should go otherwise to fatten them being diverted from this, and converted into the components of milk, cheese, or butter. When no longer profitable as milk-givers, the cows are sold to be fattened for the butcher, "or otherwise replenished for the use of the dairy keeper." Mr. Horsfall being so circumstanced as to require a supply of rich milk for butter, and as he not only fattened his cows, but purchased others to fatten in addition, he was led to devise a method of feeding which would secure the attainment of the two great objects above named. "It appeared," he remarks, "an object of importance, and one which called for my particular attention, to afford an ample supply of the elements of food suited to the maintenance, and likewise to the produce of the animal, and that if I omitted to effect this, the result would be imperfect and unsatisfactory. By the use of ordinary farm produce only, I could not hope to accomplish my purpose. Turnips are objectionable on account of their flavor, and I seek to avoid them as food for dairy purposes. I use cabbages, kohl rubi, and mangold wurzel, yet only in moderate quantities. Of meadow hay it would require, beyond the amount necessary for the maintenance of the cow, an addition of fully 20 lbs. for the supply of casein in a full yield of milk (16 quarts); 40 lbs. for the supply of oil for the butter; whilst 9 lbs. seem adequate for that of the phosphoric acid. You cannot, then, induce a cow to consume the quantities of hay requisite for her maintenance, and for a full yield of milk of the quality instanced. Though it is a subject of controversy whether butter is wholly derived from vegetable oil, yet the peculiar adaptation of this oil to the purpose will, I think, be admitted. I had, therefore, to seek assistance from what are usually termed artificial feeding substances, and to select such as are rich in albumen, oil, and phosphoric acid; and I was bound also to pay regard to their comparative cost, with a view to profit, which, when farming is followed as a business, is a necessary, and in any circumstances an agreeable accompaniment. * * *

"I now proceed to describe the means I am using to carry out the purposes which I have sought to explain. My food for milch-cows, after having undergone various modifications, has for two seasons consisted of rape cake 5 lbs., and bran 2 lbs., *for each cow,* mixed with a sufficient quantity of bean-straw, oat-straw, and shells of oats, in equal proportions—to supply them three times a day with as much as they will eat. The whole of the materials are moistened, and blended together; and, after being well steamed, are given to the animals in a warm state. The attendant is allowed 1 lb. to 1½ lb. per cow, according to circumstances, of bean-meal, which he is charged to give to each cow in proportion to the yield of milk, those in full milk getting 2 lbs. each per day, others but little: it is dry, and mixed with the steamed food on its being dealt out separately; when this is eaten up, green food is given, consisting of cabbages from October to December, kohl rabi till February, and mangold till grass time, with a view to nicety of flavor. I limit the supply of green food to 30 or 35 lbs. per day for each. After each feed, 4 lbs. of meadow hay, or 12 lbs. per day is given to each cow; they are allowed water twice a day to the extent they will drink. * * * During May my cows are turned out in a rich pasture, near the homestead; towards evening they are again housed for the night, when they are supplied with a mess of the steamed mixture, and a little hay each, morning and evening. During June, when the grasses are better grown, mown grass is given to them, instead of hay, and they are also allowed two feeds of steamed mixture. This treatment is continued till October, when they are again wholly housed." After detailing the results of his experience in thus feeding the cows, and showing that his endeavors to provide food adapted to their maintenance and improvement were "attended with success," Mr. Horsfall remarks: "On examining the composition of the ordinary food which I have described, straw, roots and hay, it appears to contain the nutritive properties which are found so adequate to the *maintenance* of the animal, whereas the yield of milk has to be provided for by a supply of extra food; the rape-cake, bran, and bean meal which I give will supply the albumen for the casein; it is somewhat deficient in oil for the butter, whilst it will supply in excess the phosphate of lime for a full yield of milk." * * * "Albuminous matter, we may infer," says Mr. Horsfall, in another part of his Prize Essay, "is the most essential element in the food of the milch-cow," and "any deficiency in the supply of this will be attended with loss of condition, and a subsequent diminution in the quality of her milk." Mr. Horsfall also adduces calculations to show that "food rich in albumen has a more especial value for the production of milk than for fattening, or beef-making." Mr. Horsfall so far modified his system of feeding that the year following he gave a less quantity of hay and roots, decreasing the former from 12 to 9 lbs., and the latter from 36 to 28 lbs. per day, and increasing the allowance of rape-cake from 5 to 6 lbs. per day; and using in addition malt combs, mixed with an equal quantity of bran (1 lb. of each per day per cow), the former being rich in albuminous matter.

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* On Breeding and Rearing Cattle, by Professor Tanner, in the Transactions of the Highland Society.

*Comparative Fattening Qualities of different Breeds of Sheep.*—From a very full and able report on this subject by Mr. J. B. Lawes, published in the *Journal of the Royal Agricultural Society of England* (vol. xvi. p. 84), we cull the following. We give, first, part of a table, which shows the "average food consumed to produce 100 lbs. increase in live-weight" by different breeds of sheep:

| | Oil-cake. | Clover. | Swedes. |
|---|---|---|---|
| Sussex | 297¼ | 285½ | 3·853¾ |
| Hampshire | 291½ | 261¼ | 3 966¾ |
| Cross bred wethers | 264½ | 251¾ | 3·725¼ |
| Ditto ewes | 263½ | 250¼ | 3 671 |
| Leicesters | 263¾ | 251¼ | 3 761 |
| Cotswolds | 253½ | 216¾ | 3 557½ |

In concluding the elaborate report, Mr. Lawes states, that "it must be admitted that, as already well known, the Downs and their crosses are better adapted to exposure and activity than the long-wooled sheep." Liberally fed, and protected from the inclemency of the weather, the long-wools, especially the Cotswolds, yield a larger amount of "gross increase for a given amount of food consumed than the Downs or crosses." The cross-breeds, between the "hardy Down and the more rapidly fattening long-wools, have some valuable intermediate qualities, which can only be maintained by keeping up the purity of the breeds from which they are derived. Those animals yielding the largest supply of mutton and wool, for the food consumed, will be the best adapted to meet the wants of the *masses* of the population." The following is a "summary" of the *practical facts relating to sheep-feeding* brought out by the experiments detailed in the report.

*Consumption of Food.*—Sheep of different breeds consume quantities of food, in proportion to their respective weights, when at equal age, stage of feeding, &c.; that is to say, three sheep, weighing 100 lbs. each, will consume the same quantity of food as two sheep of 150 lbs. Sheep on good fattening food—such as cake or corn, with chaff or roots—will consume, weekly, about 4¾ lbs. of cake, 4¾ lbs. of hay, and about 70 lbs. of roots for every 100 lbs. of their live-weight. When fed as above, they will consume every week about one-seventh of their own weight of the dry substance of food; that is, after deducting the moisture it contains.

*Rate of Increase.*—Sheep, well fed and under cover, will increase about 2 per cent. per week upon their weight; that is to say, 100 lbs. live-weight will increase from 1¾ lb. to 2 lbs. per week. To increase 100 lbs. in live-weight, sheep will consume about 2½ cwt. of cake or corn, 2¼ cwt. of hay-chaff, and 1½ to 1¾ tons of roots. The increase of a fattening sheep is at the rate of about 1 lb. live-weight to 8 lbs., or 9 lbs. of the *dry substance of the food* consumed.

*Live and Dead Weights, &c.*—Hoggets or tegs (under twelve months old), and in a lean or store condition, will contain about one-half of their weight carcass, and about one-half offal.

Shorn sheep, sufficiently fat for the market, will contain about 56 lbs. of carcass in every 100 lbs. of the unfatted live-weight.

Sheep in an ordinary state of fatness, yield from 7 lbs. to 14 lbs. of offal or loose fat per head, according to breed and size; the long-wools giving the least, and the Downs the most.

*Value of Increase, &c.*—The value of the increase of fattening sheep is less than the cost of the food consumed to produce it; the difference is to be charged to the manure.

"The value of the offal is from 4*s*. to 6*s*. per head, independently of the wool."*

Professor Tanner, in commenting upon these "valuable facts," as he terms them, states that they must be taken in connection with the system of shelter-feeding; for "if we anticipate producing the same result, regardless of shelter and protection, we shall be deceived. The increase of weight produced by a certain quantity of food must therefore be considered as the result of shed feeding."

*Quantity of Food necessary to produce 1 lb. of Flesh.*

| | | | | |
|---|---|---|---|---|
| 25 | lbs. of | milk furnish | 1 lb. | of meat. |
| 100 | " | turnips | " | " |
| 50 | " | potatoes | " | " |
| 50 | " | carrots | " | " |
| 4 | " | butcher's meat, free from fat and bone, furnish 1 lb. of flesh. | | |
| 9 | " | oatmeal | " | " |
| $7\frac{1}{16}$ | " | barleymeal | " | " |
| $7\frac{4}{16}$ | " | bread | " | " |
| $7\frac{4}{16}$ | " | flour | " | " |
| $3\frac{1}{2}$ | " | peas | " | " |
| $3\frac{8}{10}$ | " | beans | " | " |

*Table showing the Value of Meat and Manure produced by Consuming 1 Ton of each Food.*†

| MATERIALS. | MEAT. | | MANURE. | | | Total Value. |
|---|---|---|---|---|---|---|
| | Weight. | Value. | Nitrogen. | Alkalies. | Value. | |
| | lbs. | £. s. d | £. s d. | s. d | £. s. d | £. s. d. |
| Barley | 373½ | 9 6 9 | ‡ | 3 6 | ‡ | ‡ |
| Oats | 320 | 8 0 0 | ‡ | 3 6 | ‡ | ‡ |
| Beans | 280 | 7 0 0 | 1 9 3§ | 9 0 | 1 18 3 | 8 18 3 |
| Peas | 280 | 7 0 0 | 1 9 3 | 5 9 | 1 15 0 | 8 15 0 |
| Linseed-cake | 448 | 11 4 0 | 1 10 0 | 10 9 | 2 0 9 | 13 4 9 |
| English linseed-cake and peas | 498 | 14 19 0 | 0 16 8 | 8 3 | 1 4 11 | 16 3 11 |
| English linseed-cake and beans | 640 | 18 10 0 | 0 10 2 | 9 10 | 1 0 0 | 19 10 0 |
| Rape cake | 374 | 9 7 0 | 1 17 0 | 9 10 | 2 6 10 | 11 13 10 |
| Cotton cake | 374 | 9 7 0 | 2 9 0 | 8 2 | 2 17 2 | 12 4 2 |
| Clover-hay | 186¾ | 4 13 4 | 0 6 6 | 5 2 | 0 11 8 | 5 5 0 |
| Mangold | 14 | 0 7 0 | 0 2 6 | 1 4 | 0 3 10 | 0 10 10 |
| Swedes | 14 | 0 7 0 | 0 2 1 | 1 4 | 0 3 5 | 0 10 5 |
| Carrots | 13 | 0 6 6 | 0 2 4 | 1 8 | 0 4 0 | 0 10 6 |

* Mr. Lawes, in the Journal of the Royal Agricultural Society of England.

† Professor Tanner. Bath and West of England Society's Journal, vol. iii.

‡ Not sufficient evidence to justify a statement.

§ Valued as ammonia at 6d per lb.

### *Approximate Value of various kinds of Food, as Fuel to sustain Animal Heat.*[*]

| | | | | | | |
|---|---|---|---|---|---|---|
| 4 | lbs. of | potatoes | contain | 1 lb. | of | carbonaceous food. |
| 10 | " | carrots | " | " | | " |
| $1\frac{1}{3}$ | " | flour | " | " | | " |
| $1\frac{1}{3}$ | " | barleymeal | " | " | | " |
| $11\frac{1}{12}$ | " | turnips | " | " | | " |
| $1\frac{1}{3}$ | " | oatmeal | " | " | | " |
| $1\frac{9}{10}$ | " | peas | " | " | | " |
| 2 | " | bread | " | " | | " |
| $11\frac{9}{10}$ | " | milk | " | " | | " |

### *Relative nutritive Value of Farm Food at various Seasons.*[†]

| Autumn. | Winter. | Spring. |
|---|---|---|
| Rape or bole. | Swedes } equal. | Mangold. |
| Cabbage. | Mangold } equal. | |
| White Turnips. | Carrots. | |
| Swedes. | Turnips. | |

### *Live Weight of Animals produced by certain Foods.*

| Foods. | | | | Increase Live Weight. |
|---|---|---|---|---|
| 150 | lbs. of | swedes consumed in the field, | produced | 1 lb. |
| 100 | " | " " " with a shed to run under .. | " | 1 " |
| 12 | " | good clover hay ........... | " | 1 " |
| 8 | " | beans.................... | " | 1 " |
| 8 | " | peas............ ........ | " | 1 " |
| 7 | " | oats ..................... | " | 1 " |
| 6 | " | barley .................... | " | 1 " |
| 5 or 6 | " | linseed-cake ............... | " | 1 " |
| $4\frac{1}{2}$ | " | linseed-cake and peas in equal proportions ............. | " | 1 " |

*Estimated Consumption of Food by Stock.*—An ox, 1 to 2 cwts. daily of roots; a horse, 28 lbs. of hay, besides oats; a sheep out of doors, 28 lbs. of roots; under shelter, 21 lbs. Of the crops calculated to maintain the above rate of consumption, 10 per cent. should be deducted for waste and loss. In calculating food of stock, 1 lb. of hay is considered of equal nutritive value of 6 to 7 lbs. of roots, 3 or 4 of corn, 1 of oil-cake [‡]

*Amount of Fresh Air required by a Cow daily*—956½ cubic feet.[§]

*Periods of Gestation of Farm Stock.*—The mare, 334 days. The cow, 285. The ewe, 152. The sow, 112.

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[*] Dr. Lyon Playfair, in the Journal of the Royal Agricultural Society of England, vol. vi. p. 560.

[†] Professor Tanner.

[‡] J. C. Morton.

[§] Thompson.

*Periods for Hatching Poultry.*—The hen, 21 days. The goose and the turkey, 30 days.

*Analysis of Milk,* by Hadlein (inorganic constituent).

| | |
|---|---|
| Phosphate of lime | 2.31 |
| " magnesia | 0.42 |
| " peroxide of iron | 0.97 |
| Chloride of potassium | 1.44 |
| " sodium | 0.24 |
| Pure soda | 0.42 |

*Analysis of Milk,* 1,000 *parts.*[*]

| | | | |
|---|---|---|---|
| Butter | 27 | to | 35 |
| Casein, cheesy matter | 45 | to | 90 |
| Milk-sugar | 36 | to | 50 |
| Chloride of potassium and a little chloride of sodium | 1¼ | | 10 |
| Phosphates, chiefly of lime | 2¼ | | |
| Other salts | 6 | | |
| Water | 882¼ | to | 815 |

*Butter, Analysis of.*[†][‡]

| | |
|---|---|
| Pure fat or oil | 82.70 |
| Casein or curd | 2 45 |
| Water with a little salt | 14.85 |

*Milk, Analysis of, showing Dry Matter.*

| | |
|---|---|
| Pure casein | 2.00 lbs. |
| Butter | 1.25 |
| Sugar | 1.75 |
| Phosphate of lime | 0.09 |
| Chloride of potassium and other mineral ingredients | 0.11 |
| | 5.20 |

From the above analysis of 40 lbs , the dry matter is shown to be 5 20 lbs.

*Yield of Milk by Cows; proportion of Butter, &c*—"On looking over several treatises to which I have access, I find the following statistics on dairy produce. Mr. Morton, in his *Cyclopædia of Agriculture*, p. 621, gives the results of the practice of a Mr. Young, an extensive dairy keeper in Scotland. The yield of milk per cow is stated at 680 gallons per year. He obtains from 16 quarts of milk 20 ozs. of butter, or, for the year, 227 lbs. per cow; from 1 gallon of cream, 3 lbs.

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[*] Johnston's Agricultural Chemistry. Blackwood.

[†] Horsfall's Prize Essay on "Dairy Management," Journal of the Royal Agricultural Society of England, vol. xvii. p. 270.

[‡] Professor Way.

of butter, or 12 ozs. per quart. Mr. Young is described as a high feeder; linseed is his chief auxiliary food for milch cows. Professor Johnston* gives the proportion of butter from milk at 1½ oz per quart, or, from 16 quarts, 24 ozs.; being the produce of four cows of different breeds—Alderney, Devon, and Ayrshire—in pasture and in the height of the summer season. On other four cows of the Ayrshire breed he gives the proportion of butter from 16 quarts as 16 ozs., being 1 oz. per quart: these cows were likewise on pasture. The same author states the yield of butter as one-fourth of the weight of cream, or about 10 ozs. per quart. Mr. Rawlinson† gives the produce of 20,110 quarts of milk churned by hand, as 1,109 lbs of butter, being at the rate of fully 14 ozs. per 16 quarts of milk; and from 23,156 quarts of milk, 1,525 lbs. of butter, being from 16 quarts nearly 16⅞ ozs. of butter. The same author states that the yield of butter derived from five churnings of 15 quarts of cream each, is somewhat less than 8 ozs. per quart of cream. The average of butter from a cow in England is stated to be 8 ozs. or 9 ozs. per day, which, on a yield of 8 to 9 quarts, is 1 oz per quart, or for 16 quarts, 16 ozs. The quantity of butter derived from cream is stated as one-fourth, which is equal to about 9 ozs. per quart. The richest cream of which I find any record, is that brought to the Royal Society's meetings during the month of July, for the churns which compete for the prize. On referring to the proceedings of several meetings, I find that 14 ozs. per quart of cream is accounted a good yield."‡

In giving his own experience, Mr. Horsfall states that the results of various tests show a yield of from 24 ozs. to 27½ ozs. for 16 quarts of milk: he therefore assumes in his calculation "that 16 quarts of milk afford 25 ozs. of butter." In one month, the produce of fifteen cows averaged full 160 quarts per day. The following is the result of the churning of 15 quarts of cream, in three portions of 5 quarts each:

| | | |
|---|---|---|
| The first five quarts gave | 127 | oz. of butter. |
| The second gave | 125 | " |
| The third gave | 120½ | " |
| = 24¾ oz. per quart | 372½ | |

At a subsequent churning of 14 quarts of cream,

| | | |
|---|---|---|
| The first seven gave 7 rolls, or | 175 oz | of butter. |
| The second seven gave 7 rolls 2 oz | 177 | " |
| = $25\frac{1}{7}$ oz. of butter | 352 | |

*Twelve quarts of milk*, where good feeding is carried out, will give 1 quart of cream.

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* Elements of Agricultural Chemistry.

† Journal of the Royal Agricultural Society, vol. xiii. p. 38.

‡ From Mr. Horsfall's Prize Essay on "Dairy Management" in the Journal of the Royal Agricultural Society of England, vol. xvii. part I. p. 267.

*One quart of cream* will ordinarily yield 12 ozs. to 16 ozs. of butter.

*Quantity of Food consumed Weekly by Sheep for every* 100 *lbs. of their Live-weight.* —Oil-cake, 4¾ lbs.; hay, 4¾ lbs.; roots, 70 lbs. About *one*-seventh of their own weight of the *dry* substance of the food.

*Amount of food required to make* 100 *lbs. of Live-weight in Sheep.*—Cake or corn, 2¼ cwts.; hay-chaff, 2¼ cwts.; and roots, 1½ to 1¾ tons.

*Weekly Increase of Weight in Sheep.*—Two per cent. per week upon their weight.

*Rate of Increase in Weight of a Sheep proportioned to Food consumed*—One lb. live-weight to 8 or 9 lbs. of the dry substance of food.

*Proportion of Live and Dead Weights in Sheep.*—Hoggets or tegs (within twelve months old), in a lean condition, will give one-half of their weight carcass, one-half offal. Shorn sheep, fat for the market, will contain 56 lbs. of carcass in every 100 lbs. of unfattened live-weight; 7 to 14 lbs. of offal or loose fat per head, according to breed and size—"Long-wools" yielding the least, Downs the most. Value of total offal, 4*s*. to 6*s*. per head, independently of the wool.

*Weight of Turnips consumed per Day by a Sheep.*—24 lbs., according to Conwin; 38 lbs., according to Sir John Sinclair. The first gives the weight consumed by a young, the second that by an old sheep.

A bushel of turnips weighs from 40 to 45 lbs.

*The usual allowance of sheep to eat a crop of* 30 *tons of turnips* is, according to Mr. Stephens, "16 young and 8 old Leicester sheep, and 20 young and 10 old black-faced sheep per acre;" the time being 180 days, or the winter half-year. According to the same authority, *the weight of turnips consumed by an ox in a week* will be one ton. A two-year old short-horn ox consuming in 180 days 26 tons.

*Weights of the Fleece of different Breeds of Sheep of Long-wooled Breeds* (1).—The "Lincolnshire" lowland sheep, 10 lbs.; upland, 8 lbs.; "Leicester," 7 lbs.; "Cotswolds," 7 to 8 lbs; "Romney Marsh," 8 lbs.; "black-faced Scotch," 3 lbs.; "Exmoor," 4 to 5 lbs.—the fleece of the stock lambs of this breed weighs from 1½ to 2 lbs.; "Devonshire South Hams," 9 lbs.; "Bampton," 7 lbs.; "Herdwicks," 3 to 4 lbs.

*Of Intermediate Breeds.*—"Dorset," 6 lbs.—of lambs, 1½ to 2 lbs.; "Cheviots," 5 lbs.; "Radnor and Welsh sheep," 1 to 1½ lbs.

*Of Short-wooled Breeds.*—"Hampshire Downs," 7 lbs.; "Rylands," 4 lbs.; "Merino," 6 to 8 lbs.; "Shetland," 1½ lbs.*

### LIVE-WEIGHTS OF VARIOUS BREEDS OF SHEEP.

*Of Long-wooled Breeds.*—"Lincolnshire," yearlings, 80 to 100 lbs.; "Leicester," at 12 to 15 months old, 80 to 100 lbs.; at 2 years old, 120 to 150 lbs. each. "Cotswolds," 12 to 15 months old, 100 lbs; at 2 years old, 120 to 150 lbs. each.

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* Professor John Wilson in the Journal of the Royal Agricultural Society, Vol. xvi. p. 222.

"Romney Marsh," from 2 to 3 years old, 120 to 140 lbs.; "Exmoor," 4 or 5 years old, 60 to 70 lbs.; "Devonshire South Hams," 2 years old, 100 to 120 lbs. each; "Bampton," at 2 years old, 120 to 150 lbs.; "Herdwicks," 4 or 5 years old, 40 to 50 lbs.

*Intermediate Breeds.*—"Dorset," at 2 years old, 80 to 100 lbs.; "Cheviots," at 3 years old, 70 to 80 lbs.; "Radnor and Welsh Sheep," 30 to 40 lbs.

*Short-wooled Breeds.*—"South Downs," 12 to 15 months old, 80 lbs.; 2 years old, 100 to 120 lbs. each. "Hampshire Downs," 80 to 100 lbs., 12 to 15 months old; "Shropshire Downs," 80 to 100 lbs.; "Ryeland," 2 and 3 years old, 50 to 75 lbs.; "Merino," 2 years old, 110 to 120 lbs.*

*Live-Weight, proportion of to Offal, in Sheep and Cattle.*—In sheep, five-fourteenths of live-weight is offal; in cattle, six-fourteenths.

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* See article by Professor John Wilson in the Royal Society's Journal, Vol. xvi.

# THE SORGHO, OR CHINESE SUGAR CANE.

The sorgho appears to be a plant of a nature between the sugar cane of the West Indies and the maize or Indian corn. It is like the former in the stem, but, so far as we can ascertain, is nowhere like it a perennial plant. It comes to maturity in five months, whilst the cane requires from twelve to eighteen months, according to the irrigation applied to it. With regard to the maize, the sorgho resembles it in its growth, foliage and constitution, but is totally different in granular produce. In saccharine properties the cane and the sorgho are nearly of an equal value; for whilst the cane yields from fourteen to eighteen per cent of saccharine, the sorgho will yield according to Leplay fifteen, and to Dupeyrat ten per cent. of crystallizable sugar, of precisely the same character as that of the cane, the beet-root and the maple. As fodder, however, the sorgho possesses valuable properties, and will doubtless be extensively cultivated in the north of France. Whether for that purpose it could be grown in the United Kingdom remains to be proved; but, at any rate, it is worth trying. In that case it ought to be sown in the latter end of June, or early in July, when there is no danger from frost. It will then be ready to cut in September, and continue until November. If the plants were raised on seed-beds, protected from the frosts at night, it would enable the grower to obtain them at least a month earlier, and they would then come in at a period when the dry weather would render them particularly useful for cattle. With respect to the mode of cultivating the sorgho, it is sometimes sown broad-cast and sometimes in drills. Another method is by throwing the land into small hillocks by first ploughing it in the Northumberland fashion, and then by cross-ploughing, to form it into squares, upon which put in about four seeds or plants (if ready), at a distance of about a foot apart. A small quantity of guano, or other artificial manure, put in near, but not with the seed, will materially promote its growth. A light sandy soil is the most adopted to the sorgho, but it should be well manured. The Landes, in the department of the Loire, to which the statement of M. Dupeyrat refers, are a pure-moving sand; ten pound of seed per acre is about the quantity. It should be previously steeped in water from twenty-four hours to three days; the latter in order to hasten its growth. The seeds which swim on the top should be thrown away, as only that which sinks to the bottom will vegetate. The quantity of produce from the sorgho is prodigeous. Dupeyrat speaks of a return at Begrie, in 1857, in one cutting, of one hundred and twenty-three thousand kilos per hectolitre, or about forty-eight and a half tons per acre. It grows from nine to twelve feet high, the specimen we have received being fully the latter. It throws out several stems from the root, and when intended for sugar-making the weak roots are taken off, leaving from three to five only of the stronger ones, but when it is intended for fodder this is unnecessary. In France it is used in the making of wine; and two ares, which are two hundred and thirty-nine square yards, yielded one hundred and thirty-two gallons of excellent wine. In distilling the ripe plant will produce from seven hundred and forty-five to nine hundred and eighty per cent. of alcohol. This refers to the South. It is estimated that forty-four thousand kilos of green sorgho are equal to sixteen thousand kilos of hay in nutritive properties.

The cattle are remarkably fond of it, and will leave any other food whatever for it.—*Abridged from Farmer's Magazine, age 160, vol. for 1859.*

### THE EXHAUSTION OF THE SOIL BY THE CULTURE OF SORGHO.

I have submitted this grain for analysis, employing African samples, for which I am indebted to M. Leplay. From my various researches the following mean figures result, relative only to the substances interesting in the present point of view. These figures have been established in one thousand of the matter analysed:

| | | | |
|---|---|---|---|
| Organic matter.................. | 10,937, | or azote.............. | 1,750 |
| Ashes ......................... | 37,000, | of which acid phosph.. | 23,896 |

These results do not differ very widely from those already obtained from various chemists, and principally from Professor Filhol, who only marked the figure of the albuminous matter, valued by him at 1.5, for one hundred. By their aid it is now possible to calculate exactly the absolute quantity of azote and mineral matter taken from the soil by sorgho. But what is of more importance is to compare it with what is taken from the earth by other plants. Now, among those grown in the South, there is only wheat and maize which may be put on a level with the sorgho, and more particularly the latter, on account of the similarity in the method of cultivation which they both require. If then we examine their chemical composition, established by M. M. Bousingault and Payen, we find there is found in wheat, in one thousand

| | | | |
|---|---|---|---|
| Organic matter,................ | 144,000, | or azote.............. | 20,900 |
| Ashes ........................ | 24,100, | of which acid phosph.. | 11,323 |

M. Peligot, who has particularly examined the wheat in the South, finds one hundred and sixty parts of albuminous matter in it; and, in maize, M. Pogilas has found ninety-nine only. M. Payen has given the following analysis of maize:

| | | | |
|---|---|---|---|
| Organic matter.................. | 123,000, | or azote ............ | 19,680 |
| Ashes ......................... | 12,000, | of which acid phosph.. | 5,465 |

From these figures we find that a crop of sorgho takes from the soil twenty-one parts less of azote than wheat, and eighteen less than maize. In return, the quantity of phosphoric acid, subtracted, is nearly double that taken by wheat, and four times more than maize—admitting, however, that we have not reckoned on the chaff of the maize, which, as every one knows, leaves, in burning on our hearths, a large proportion of ashes. It would follow, then, that, weight for weight, the culture of sorgho would exhaust more mineral matter and much less of azote—which, as every one knows, costs the farmer ten times more than for phosphoric acid. Thus, the kilogramme of azote is not too dear at three francs. Phosphoric acid, in the state of phosphate of lime, costs only about twenty-five cents the kilogramme.—*From the "Journal de la societe centrale d'Agriculture de Belgique," September,* 1859, *page* 342.

### VALUE OF SORGHO AS A FORAGE PLANT.

The sorgho at first was praised beyond measure; then it was declared to be poisonous, and that it diminished the quantity of milk. In short, after repeated experiments, made by very distinguished farmers, it was considered as one of the best fodder plants we can cultivate. In his experiments, made in 1856 and 1858. M. F. Peer has obtained the following results:—

In the month of May a field was sown, hoed and cleaned as usual. The plants, fifteen centimetres distant, soon began to spring up. At the end of July they were cut down and given as fodder to 4 cows who ate it greedily. These cows were fed on it entirely from the beginning of August till the beginning of October, a period of sixty days. The quantity of milk was the same during this period, The ration of each cow was about seventy-five kilos of the stalks of the herb, or thirty kilos for the four cows; and a field of twenty six ares furnished this quantity for sixty days. M. Peer concluded from these experiments that sorgho, two metres high, can produce, without exaggeration, seventy-two thousand kilos to the hectare. He cut down the sorgho several times, but the last, in August, produced only thin stalks for the sheep. This plant can be cut several times in the year—only when the soil is rich. In August the lower part of the stalk had become stringy. These were cut down and mixed with the leaves, so that not a blade was lost. M. Peer considers a single cutting of sorgho worth four of clover; that is to say a hectare of sorgho is worth more than two hectares of clover as food for cattle. As yet the sorgho has been attacked by no insect, and it is ready for the cattle at the time when the other plants are dried up by the sun. These are two great advantages. Sorgho cultivated on some lands imbibes poisonous qualities, for which it has been rejected by certain farmers. The accidents caused by sorgho might have been prevented at first by prudent and judicious experiments. If it produces a bad effect it may be mixed with other ingredients. If it is not injurious administer it confidently—and this is nine-tenths of the case.—*From the Journal (June No.,* 1859,) *de la societe centrale d'Agriculture de Belgique.*

# LAWS OF OHIO

FOR THE

# ENCOURAGEMENT OF AGRICULTURE.

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## AN ACT

### For the Encouragement of Agriculture.

SECTION 1. *Be it enacted by the General Assembly of the State of Ohio,* That whenever thirty or more persons, residents of any county or district embracing two counties of this State, shall organize themselves into a society for the improvement of agriculture within said county or district, and shall have adopted a constitution and by-laws, agreeably to the rules and regulations to be furnished by the Ohio State Board of Agriculture, hereinafter created, and shall have appointed the usual and proper officers; and when the said society shall have raised and paid to their treasurer, by voluntary subscription, or by fees imposed upon its members, any sum of money in each year, not less than fifty dollars; and whenever the president of said society shall certify to the respective county auditors, the amount thus paid, attested by the oath of the treasurer before a magistrate, it shall be the duty of the said county auditors, embraced within the district in which such society shall be organized, to draw an order on the treasurer of the respective county, in favor of the president and treasurer of said society, for a sum equal to the amount thus raised; provided it does not exceed half a cent to each inhabitant to the said county, upon the basis of the last previous national census, but not to exceed in any county the sum of two hundred dollars, and it shall be the duty of the treasurer of the said county to pay the same.

SEC. 2. That it shall be the duty of the several county or district societies which may be formed under the provisions of the preceding section, during the continuance of this act, annually to offer and award premiums for the improvement of soils, tillage, crops, manures, implements, stock, articles of domestic industry, and such other articles, productions and improvements, as they may deem proper, and may perform all such acts as they may deem best calculated to promote the agricultural and the household manufacturing interests of the district and of the State; and it shall also be their duty, so to regulate the amount of premiums and the different grades of the same, as that it shall be competent for small as well as large farmers to have an opportunity to compete therefor; and in making their awards, special reference shall be had to the profits which may accrue, or be likely to accrue, from the improved mode of raising the crop, or of improving the soil or stock, or of the fabrication of the articles thus offered, with the intention that the premium shall be given for the most economical mode of improvement; and that all persons offering to compete for premiums, on improved modes of tillage, or the production of any crops, or other articles, shall be required, before such premiums are adjusted, to deliver to the awarding committee a full and correct statement of the process of such mode of tillage or production, and the expense and value of the same, with a view of shewing accurately the profits derived or expected to be derived therefrom.

Sec. 3. It shall be the duty of each county or district society to publish annually a list of the awards, and an abstract of the treasurer's account, in a newspaper of the district; and to make a report of their proceedings during the year, and a synopsis of the awards for improvements in agriculture, and household manufactures, together with an abstract of the several descriptions of those improvements, and also make a report of the condition of agriculture in their county or district, which reports shall be made out in accordance with the rules and regulations of the Ohio State Board of Agriculture, and shall be forwarded to the State Board at their annual meeting in December, in each year; and no subsequent payment shall be made from the county treasurer, unless a certificate is presented to the auditor from the president of the State Board, showing that such reports have been duly made.

Sec 4. That Michael L. Sullivant and Samuel Medary, of Franklin county; Allen Trimble of Highland; Samuel Spangler and John Chaney, of Fairfield; Darius Lapham, of Hamilton; John B. Bayless, of Jefferson; Greenbury Keen, of Portage; Simon Perkins, of Summit: John I. Vanmeter, of Pike; Arthur Watts and Felix Rennick of Ross; Elias Florence and William Gill, of Pickaway; Jared P. Kirtland, of Cuyahoga; D. Gregory, of Delaware; John McElderry, of Tuscarawas; Isaac Moor, of Lake; J. Fuller, of Erie; George W. Gibbons, of Muskingum; Horatio Gillet, of Lawrence; Anson Howard, of Champaign; John Eccles, of Hancock; Ziba Lindley, Jr., of Athens; Henry O. Brish, of Seneca; Samuel Myers, of Crawford; David Stevens, of Richland; John Martin, of Columbiana; Gilman C. Mudgett, of Paulding; L. O. Goble, of Putnam; Isaac Neiswanger, of Belmont; Aaron Johnson, of Perry; William McFadden, of Harrison; Frederick Bonner, of Greene; Jacob T. Pugsley, of Fayette; John W. Cowden, of Trumbull; Billius Kirtland, of Mahoning; Richard Warner, of Medina; John M. Millikin and Absalom Dunn, of Butler; John Johnson, of Miami; Jesse Wilson, of Shelby; Abraham Studdebaker, of Darke; Joseph Burns, of Coshocton; James L. Reynolds, of Stark; Newton Larsh, of Preble; A. E. Strickle, of Clinton; Benjamin Ruggles, of Henry; —— Protsman, of Montgomery; William R. Putman, Jr., of Washington; James Louden, of Brown; Dowty Utter, of Clermont; and Beatty McFarland, of Jefferson county, be and they are hereby created a body corporate, with perpetual succession, in the manner hereafter described, under the name and style of the "Ohio State Board of Agriculture."

Sec 5. It shall be the duty of said Board, or any ten of them, to meet in the city of Columbus, on the first Wednesday of April, after the passage of this act, and to organize by appointing a president, secretary and treasurer, and such other officers as they may deem necessary; also determining by lot the time that each member shall serve, so that the term of service of one-half of the members shall expire annually, on the day of the annual meeting in December; and the president shall have power to call meetings of the Board whenever he may deem it expedient.

Sec. 6. There shall be held in the city of Columbus, on the first Wednesday after the first Monday in December, an annual meeting of the Ohio State Board of Agriculture, together with the president of each County Agricultural Society, or other delegates therefrom, duly authorized, who shall, for the time being, be ex officio members of the State Board of Agriculture, for the purpose of deliberation and consultation as to the wants, prospects and condition of the agricultural interest throughout the State; and at such annual meeting, the several reports from the county societies shall be delivered to the president of the Ohio State Board of Agriculture; and the said president and delegates shall, at this meeting, elect suitable persons to fill all vacancies in the Ohio State Board of Agriculture.

Sec. 7. And it shall be the duty of said Board to make an annual report to the General Assembly of the State, embracing the proceedings of the Board for the past year, and an abstract of the proceedings of the several agricultural societies, as well as a general view of the condition of agriculture throughout the State, accompanied by such recommendations as they may deem interesting and useful.

Sec. 8. That the act to authorize and encourage the establishment of agricultural societies in this State, and for other purposes therein set forth, passed March twelfth, one thousand eight hundred and thirty-nine, be and the same is hereby repealed; provided the acts done, obligations incurred, and rights acquired under the provisions thereof, shall remain in no wise altered or affected by this act.

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## AN ACT

To amend an act entitled "An act for the encouragement of Agriculture," passed February 27, 1846.

SECTION 1. *Be it enacted by the General Assembly of the State of Ohio,* That the "Ohio State Board of Agriculture" shall consist of ten members, five of whom shall constitute a quorum.

SEC. 2. That Allen Trimble, M. L. Sullivant, Samuel Medary, Darius Lapham, A. E. Strickle, Arthur Watts, M. B. Bateham, John Codding, Jared P. Kirtland and I Moore, be continued members of the Board, the term of service and the mode of appointing their successors to remain unaltered by this act.

SEC. 3. That the sum of two hundred dollars be and the same is hereby appropriated from the treasury for the use of the Board; and an account of the expenditures of the Board shall be included in the annual report of the Board to the General Assembly.

SEC 4. So much of the law to which this is an amendment, as conflicts with the provisions of this act, is hereby repealed.

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## AN ACT

To create a Permanent Agricultural Fund for the State of Ohio.

SECTION 1. *Be it enacted by the General Assembly of the State of Ohio,* That there shall be created, from the several sources hereinafter mentioned, a fund which shall be known as the "State Agricultural Fund."

SEC. 2. That the minimum amount authorized to be charged by county auditors for permits under the law passed February eighth, one thousand eight hundred and thirty-one, entitled "an act to regulate public shows," shall be and is hereby increased to twenty dollars, and that one-half the revenue in each and every county, derived from such source, be set apart to the "State Agricultural Fund," to be paid over by the county treasurer to the Treasurer of State, at their settlements with the Auditor of State, as other moneys collected for that purpose now are; and that the other half remain, as now provided by law, for the use and benefit of the common school fund.

SEC. 3. That whenever any real or personal property shall escheat to the State, under the eighth and ninth sections of an act entitled "an act regulating descents and the distribution of personal estates," passed February twenty-fourth, one thousand eight hundred and thirty-one, and all such as have heretofore so escheated under the provisions of said law, and which have been taken possession of under the law entitled "an act concerning escheated lands," passed February twenty-five, one thousand eight hundred and thirty three, shall be taken possession of in the name of the State, by the county auditor of the county in which such property may be found, and by him sold at public auction, at the county seat of such county, to the highest bidder, after having given thirty days notice of such intended sale, in some newspaper printed within the county.

SEC. 4. The court of common pleas shall, on the application of the county auditor, appoint three disinterested freeholders of the county to appraise such real property, who shall be governed by the same rules as appraisers in sheriff's or administrator's sales; and the auditor shall sell such property at not less than two-thirds its appraised value, and may, at his discretion, sell the same for cash, or one-third cash, and the balance in equal annual payments; the deferred payments to be amply secured; and, upon the payment of the whole amount of consideration money, shall execute a deed to the purchaser, in the name and on behalf of the State of Ohio.

SEC. 5. All moneys arising from sales under this act, shall be paid over by the county auditor to the treasurer of the county, to be by him accounted for and paid into the State treasury at his annual settlement with the Auditor of State, as other moneys collected for State purposes for the use and benefit of the "State Agricultural Fund."

SEC. 6. The fund hereby created shall be at the disposal of the State Board of Agriculture, for the improvement of the agricultural interests of the State, in such manner as they may deem most conducive to that object, until otherwise provided for by legislative enactment; and shall at all times be held subject, upon such property being reclaimed by any heir, to the payment to the purchaser of the State, of the original purchase money and legal interest, to the time of such reclamation.

(Sections seven to ten inclusive relate to the use of escheated lands in the city of Cincinnati, for the benefit of the "house of correction," established there.)

SEC. 11. All acts and parts of acts inconsistent with this act are hereby repealed.

Passed February 8, 1847.

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## AN ACT

Further to amend an act entitled "An act for the encouragement of Agriculture," passed February 27, 1857.

SECTION 1. *Be it enacted by the General Assembly of the State of Ohio*, That the Ohio State Board of Agriculture shall have power to audit and pay the ordinary expenses of the Board, including the necessary personal expenses of members in their hands, or that may arise under the provisions of the "act to create a permanent agricultural fund in the State of Ohio, and for other purposes," passed February 8, 1847; and it shall be the duty of the Board, in their annual report, to state the names of the persons to whom any payment is made under this act, and the amount paid to each.

SEC 2. This act to take effect from and after its passage.

Passed February 18, 1848.

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## AN ACT

To protect agricultural fairs and fair grounds.

SECTION 1. *Be it enacted by the General Assembly of the State of Ohio*, That it shall be lawful for any justice of the peace, on the application of any of the officers of any State, county, township, or any independent agricultural societies, or industrial associations, to appoint a suitable number of special constables, to assist in keeping the peace during the time when such society shall be holding their annual fairs, and make an entry in his docket of the number and names of all such he shall appoint.

SEC. 2 All such constables so appointed shall have all the power of constables to suppress riots, disturbances and breaches of the peace; they may, upon view, arrest any person or persons who may be guilty of violating any of the laws of the State, may pursue and arrest any person fleeing from justice in any part of the State; to apprehend any and all persons in the act of committing any offense against the laws thereof, and may, upon reasonable information, supported by affidavit, procure process for the arrest of any person or persons who may be charged with a breach of the peace, and forthwith bring such person or persons before the competent authority, and enforce all the laws for the preservation of good order.

SEC 3. No person shall be allowed to keep any shop, booth, tent, wagon, or other carriage, vessel or boat, or any stand or table for the sale of any spirituous or other liquors, or sell or expose to sale, give, barter or otherwise dispose of, in or near such shop, booth, tent, wagon, or other carriage, vessel, boat, stand or table, or in any other way or place, any spirituous or other liquors, at or within the distance of two miles from the place where any such agricultural fairs are held.

SEC 4. That any person or persons who shall be guilty of a breach of this act, and shall be notified by any one of the officers authorized to make an arrest or seizure, or by any other person, that he, she or they are violating the law; and if, after such notice, such person shall continue in such violation, he, she or they shall forfeit and pay for such offense, a fine of not less than five nor more than fifty dollars, to be paid over to the treasury of such agricultural society where the offense was committed; and any judge of the court, sheriff, coroner, justice of the peace, of the proper county, or any constable of the proper township, or the constables specially appointed, shall, upon view or information, without warrant, apprehend any person so offending, and seize such booth, tent or wagon, or other carriage, stand, vessel or boat, selling spirituous or other liquors, and convey the same to a place of safe keeping, and take the person so offending before some officer having competent jurisdiction, together with an inventory of the things so seized, and the officer before whom such alleged offender shall be brought, shall proceed forthwith to inquire into the truth of the accusation, and if true, shall enforce the penalties of this act.

SEC. 5. If the accused shall fail to pay such fines as shall be assessed, together with all of the costs of proceedings, including the necessary expenses of such seizure, the said officer before whom such offender was tried, shall forthwith issue a venditioni exponas, commanding any constable of the township in which such inquiry shall be held, to make the fine and costs, necessary expenses, and costs of execution, by sale of so much of the property as shall be necessary therefor, and make return thereof within ten days thereafter.

SEC. 6. That in the execution of the venditioni exponas, the said constable, at least ten days before the sale, shall advertise the property to be sold at two of the most public places of the township, where the same is to be sold, at one of which places, to be designated in the notice, between the hours of ten o'clock A M. and four o'clock P. M., said sale shall be held; said constable first selling or offering for sale the articles which the offender brought on to the ground for traffic, and the overplus of the property so seized as aforesaid, after the satisfaction of said venditioni exponas, shall be delivered to the defendant, on demand; but if he shall fail to demand the same for ten days after such sale, the same shall become forfeited to the said agricultural society, and if the property so seized shall be found insufficient to satisfy said venditioni exponas and costs of execution, said justice of the peace shall, at any time thereafter, on request of the treasurer of said society, issue a fieri facias to collect the balance thereof.

Passed April 11, 1856.

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## AN ACT

To amend section three and section six of an act for the encouragement of agriculture, passed February 28, 1846.

SECTION 1. *Be it enacted by the General Assembly of the State of Ohio,* That section three of the above recited act be amended so as to read as follows: It shall be the duty of each county or district society to publish annually a list of awards, and an abstract of the treasurer's account in a newspaper of the district; and to make a report of their proceedings during the year, and a synopsis of the awards for improvements in agriculture and household manufactures, together with an abstract of the several descriptions of these improvements, and also make a report of the condition of agriculture in their county or district; which reports shall be made out in accordance with the rules and regulations of the Ohio State Board of Agriculture, and shall be forwarded to the State Board at their annual meeting in January in each year; and no subsequent payment shall be made from the county treasury unless a certificate be presented to the auditor, from the president of the State Board, showing that such reports have been made.

SEC. 2. That section six be amended so as to read as follows: There shall be held in the city of Columbus on the first Wednesday after the first Monday in January, an annual meeting of the Ohio State Board of Agriculture, together with the President of each County Agricultural Society, or their delegate therefrom duly authorized, who shall for the time being be ex officio members of the State Board of Agriculture, for the purpose of deliberation and consultation, as to the wants, prospects, and condition of the agricultural interests throughout the State; and at such annual meeting the several reports from the county societies shall be delivered to the President of the Ohio State Board of Agriculture, and the said president and delegates shall at this meeting, elect suitable persons to fill all vacancies in the Ohio State Board of Agriculture.

Sec. 3. That sections three and six be and the same are hereby repealed.

Sec. 4. This act shall take effect and be in force from and after its passage.

Passed February 20, 1861.

### AN ACT

To protect agricultural fairs.

Section 1. *Be it enacted by the General Assembly of the State of Ohio,* That it shall be unlawful for any person to exhibit or show any natural or artificial curiosity for any price or gain, or shall set up to let or use for profit any swing, revolving swing, flying horses, or whirligigs within one-fourth of a mile of the fair ground of any agricultural society in this State, while the fair of such society is being held therein, unless such person shall first have obtained the written permission of the Board of such agricultural society to make such exhibition.

Sec. 2. That if any person shall violate the provisions of this act, he shall, on conviction thereof, be fined in any sum not less than one nor more than one hundred dollars; and all moneys derived from the violation of this act shall be appropriated to the support of common schools.

Sec. 3. This act shall take effect from and after its passage.

Passed April 6, 1861.

### AN ACT

To provide for the creation and regulation of township agricultural societies.

Section 1. *Be it enacted by the General Assembly of the State of Ohio,* That when any number of natural persons of any township in the State of Ohio shall form an association for the promotion of agriculture in such township, and shall, under their hands and seals, make a certificate, and acknowledge the same before a justice of the peace, in which shall be specified the name of the society, the objects of its formation, and the township in which it shall be located, and shall record the same in the recorder's office of the proper county, such society shall be deemed a body corporate, with succession, and with power to sue and be sued, plead and be impleaded, defend and be defended, contract and be contracted with; to make and use a common seal, and the same to alter at pleasure; and shall have power to purchase and hold, in fee simple, or to rent or lease such real estate as may be required as a site for holding fairs, not exceeding twenty acres, and to establish all necessary rules and regulations for the management of such fairs, and the legitimate business of the society.

Sec. 2. This act shall take effect on and after its passage.

Passed May 1, 1861.

## LAW RELATING TO PUBLIC SHOWS.

### AN ACT

To amend an act entitled "An act to regulate Public Shows," passed February 28, 1831.

Section 1. *Be it enacted by the General Assembly of the State of Ohio,* That so much of the first section of the act to which this is an amendment, as provides that it shall not be necessary for any exhibiter or exhibiters of any show allowed to be exhibited by said act, to obtain a permit from the county auditor, to show or exhibit in any incorporated town or city, where by the laws or ordinance of such town or city, such exhibiter or exhibiters may be required to obtain a permit or license from the municipal authority of said town or city, be and the same is hereby repealed.

Sec. 2. Before any person or persons shall be permitted to exhibit any public show; in any incorporated town or city in this State, he or they shall first be required to obtain a permit from the auditor of the county in which such town or city may be located, according to the provisions of the act to which this is an amendment, and the act to create a permanent agricultural fund, passed February 6, 1847, and all moneys paid into the treasuries of the several counties under the provisions of this act, shall be paid over and disposed of according to the provisions of the act above named.

Sec. 3. Nothing in this act shall be construed to interfere with the right or power of any incorporated town or city of this State, to impose a license upon all shows exhibited in such town or city in addition to that imposed by this act.

Passed March 21, 1849.

### EXPLANATIONS.

The law to which the foregoing is an amendment, says:

"That before any exhibiter or exhibiters of any traveling public show, not already prohibited by law, shall be allowed to exhibit or show any natural or artificial curiosity, or exhibition of horsemanship in a circus or otherwise, for any price, gain or reward, he or they shall apply to the auditor of the county in which he or they intend to show or exhibit, for a permit; and the county auditor shall give him or them a permit, specifying the time, place or places he or they may be allowed to show or exhibit in the county, on the persons thus applying, paying into the county treasury the amount said county auditor may assess on him or them for the privilege of exhibiting or showing such show; which assessment shall in no case exceed fifty dollars, nor less than ten for each and every place at which such show shall be exhibited. Provided, it shall not be necessary for any exihibiter or exhibiters, as aforesaid, to obtain a permit from the county auditor, to show or exhibit in any incorporated town or city, where, by the laws or ordinances of such town or city, such exhibiter or exhibiters may be required to obtain a permit or license from the municipal authoriy of said town or city."

The act creating a permanent agricultural fund, passed February 8, 1847, provides that the minimum amount subscribed to be charged by county auditors for permit under the law of 1831, shall be increased to twenty dollars, and one-half the income derived from this source shall go to the agricultural fund—the balance to the common school fund, as before. But this act, as well as that of 1831, had no effect in incorporated towns and cities; and it was only in a few cases that county auditors were called on to grant license for such shows; while the authorities of towns and cities were by law allowed to charge a small or large sum, or nothing at all, as they might see fit, and make such disposition as they pleased of the revenue derived from this source. Thus it will be seen that the objects of the law of 1846 were not secured; and hence the reasons for the additional law of the present year.

This law does not interfere with the right of incorporated towns and cities; but it makes it imperative on the exhibiters of public shows to first obtain a permit from the county auditor, in all cases; then if the town or city ordinances require it, another permit must be obtained from the authorities of such town or city. Some persons may think that these laws impose too heavy tax on such exhibitions; but we think that a large majority will agree that it will be no loss to the morals of community, even if the effect should be a reduction of the number in our State.

Note.—The penalty for violating the law, for exhibiting without a proper license, is a fine of one hundred dollars for each offense.

# RULES

## *For the Organization and Management of County and District Societies.*

I. The officers of each Society shall consist of a President, Vice President, Treasurer, Secretary and at least five Managers or Directors, who, together, shall constitute a Board of Directors for the management of the affairs of the Society, and shall hold their offices until their successors are duly elected.

II. Members of the Society must be residents of the county or district, must be over twenty-one years old, and must annully pay the sum of one dollar to the Treasurer.

III. The Treasurer shall keep a list of the members of the Society, so that he may be able to report to the State Board the number of members each year, and so that it may be ascertained who are entitled to vote for officers.

IV. The election for officers, for each County and District Society, shall be held in each year, at such time in January as the County or District Society may determine upon.

V. County or District Societies may open their premium lists to all persons, without restriction, except on field crops, which shall be confined to the county or district.

VI. Competitors for premiums must be members of the society.

VII. All articles offered for premiums must be owned by the person offering the same, or by some member of his or her family.

VIII. Awarding committees must comply with the provisions of the law requiring competitors for premiums on crops and other improvements to furnish full and accurate statements of the process, expense of culture, production, &c.

IX. Competitors for premiums on crops shall be required to have the ground and its products accurately measured, and satisfactory proof, under oath, must be furnished by each competitor.

X. Each Society shall have duly prepared an annual report, and shall present the same to the State Board of Agriculture, on or before the annual meeting of said Board, as prescribed to be held by the 2d section of the "Act for the encouragement of Agriculture," passed April 6th, 1861.

XI. Said report shall contain the following :

1. A list of the premiums awarded at the previous Annual Fair.

2. A copy of the published abstract of the Treasurer's account, as the same was published, in conformity with the 1st section of the above named act.

3. All statements of competitors for premiums on crops and other improvements in agriculture, detailing mode of tillage, &c., &c.

4. A general account of the proceedings of the Society, the number of its members, and the prospects of its progress and usefulness.

5. A statement of the principal crops raised in the county or district; an estimate of the amount of each raised ; the average yield per acre ; the striking characteristics of the previous season ; the names of the destructive insects which may have injured the crops ; and such other facts as will tend to give a full view of the state of agriculture in each county or district so that the same may be embodied in the succeeding Annual Report, made by the State Board to the Legislature.

# ERRATA.

Page 175, 4th line from top, for "Liberia" read "Siberia."

Page 223, line 10 from bottom, after 'fecundating" read "principle."

Page 228, line 9 from the top, after "Koelreuter" read "is."

Page 229, line 9 from bottom, after the word "artificial" read "classification."

Page 234, in first line of second paragraph, omit the words "also which." Fourteenth line from bottom, after "that" read "by."

Page 238, line 18 from the top, after "dry" read "season."

Page 244, line 13 from top, after "latitude" read "or."

Page 274, in the column headed "max," opposite may read "28.30" instead of "20.34."

Page 280, second line from bottom, instead of "loose" read "lose."

Page 286, last line, for "estimation" read "possession."

Page 328, line 19 from the top, for "been" read "Bean."

Page 392, line 9 from top, instead of "rivults" read "rivulets."

Page 393, line 10 from bottom, for "or" read "of."

Page 403, line 20 from bottom, for "extended" read "expended."

Page 405, third line from top, for "fungi" read "fungus."

Page 411, sixth line from bottom, for "July" read "February."

Page 415, line 2 from the top, for "*herbarium*" read "*Herbarum*."

Page 420, line 2 from bottom, for "symptoms" read "systems."

Page 425, line 3 from top, for "micheli" read "michaeli."

Page 441, top line, for "62,007,153" read "24,823,566." This error was copied from census report.

Page 454, line 20 from the top, for "or" read "for."

Page XXIII, fifth line from top, for "musticate" read "masticate."

Page XXVI, twelfth line from bottom, for "indepently" read "independently."

Page XXVII, last line, after "division" read "of."